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ADVANCED DECOY TECHNOLOGY PROGRAM
ADTECH IV
FINAL REPORT (U)

APPENDIX II
USERS MANUAL--OPTIMUM DECOY DESIGN PROGRAM

AD853821

Prepared by

AVCO GOVERNMENT PRODUCTS GROUP
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201 Lowell Street
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AVMSD-0465-68-RR, APP. II
Contract F04701-68-C-0012

June 1969

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Advanced Research Projects Agency
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THIS DOCUMENT IS SUBJECT TO SPECIAL EXPORT CONTROLS AND EACH TRANSMITTAL TO FOREIGN GOVERNMENTS OR FOREIGN NATIONALS MAY BE MADE ONLY WITH PRIOR APPROVAL OF SPACE AND MISSILE SYSTEMS ORGANIZATION ~~[illegible]~~

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Prepared for

SPACE AND MISSILE SYSTEMS ORGANIZATION
DEPUTY FOR REENTRY SYSTEMS
AIR FORCE SYSTEMS COMMAND
Norton Air Force Base, California 92409

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UNCLASSIFIED ABSTRACT

(U) This technical report describes analyses and techniques used in the design and evaluation of advanced decoy concepts. The work described addresses both the design of specific penetration aid elements and the formulation of techniques for their evaluation. The three major technical areas covered in this report are:

1. Investigation of a penetration aid technique that degrades the measurement capability of the radar sensor.

2. The design of a computer program to solve the decoy design problem with flexibility in the selection of optimization criteria and constraints.

3. Studies of the use of certain discrimination techniques for a hard point defense system.

This appendix to this report contains the input-output information for the optimum decoy design program.

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1.0 Introduction

This manual for the ADTECH Optimum Decoy Design Program is designed for immediate reference by the person actually filling out the input sheets for the program. It contains discussions describing the input interrelationships and a number of tables which are useful to the user. Each of the input symbols are defined in detail and suitable notes and comments are included along with the definitions. Blank input sheets are included which may be reproduced for production use of the program. Input sheets and a listing of the actual input card images are included for one long check problem and seven short ones. The total printout for the seven short problems and selected critical parts of the printout for the long problem are included along with a detailed description of the output. The plots produced by these check cases are also presented. These check problems and their descriptions provide a means for testing the operation of the program at other installations.

Flow charts of the subroutines of the overall program are shown in Figures 1 and 2 for reference.

2.0 Discussion of Input Techniques

The primary use of the Optimum Decoy Design Program involves the comparison of calculated decoy performance data with stored reentry vehicle data and subsequent adjustment of the decoy design to improve or optimize its performance. Secondary uses of the program include the evaluation and comparison of a single decoy with a reentry vehicle, calculation of the trajectory of a single object without comparisons, calculation of drag coefficients for flight or wind tunnel conditions without trajectory calculations, and classic check problems for research in optimization methodology. Since the requirements for decoy performance vary with mission objectives, considerable flexibility in stating the problem has been coded into the program. The requirements for flexibility lead to a significant number of input options and input quantities in the program; however, for current use, a large number of quantities have been "preset" to help relieve the user of the need to enter the same data over and over. A word of caution is necessary, however, to indicate that the user has the ultimate responsibility for judging whether the preset values of the input are suitable for his particular problem.

2.1 Input Interrelationships

Many of the input quantities are not used in a typical calculation. It is helpful to the user if he can concentrate his attention on those inputs which will be used. Figure 3 shows an Avco invented device for presenting the interrelationships between the inputs. This presentation allows the user to identify the input quantities which actually need attention during the preparation of the inputs.

It is essential that the user have an unambiguous and complete statement of his objectives and requirements clearly in mind before he

prepares the input or attempts to use Figure 3. One of the most common problems with a large program comes about when the user attempts to change the objectives of his calculations after the preparation of the input sheets has been started. The wisdom of not changing horses in mid-stream applies to the preparation of these inputs.

Figure 3 is intended to be used in the following manner. With a clear statement of objectives in mind, the user starts at the top of the table and looks up the definitions of the quantities which are listed there in the Definition of Input Symbols section of this report. As values of the option codes are determined, associated symbols listed under these values in Figure 3 must be looked up and their values assigned. These associated symbols are listed only for the user's consideration and do not guarantee that the symbol will actually be used. In some cases the listed symbols may contain a few symbols which are not actually being used in the option being considered but were added to simplify the construction of the table. Tracing out a given problem will result in a path down through this table which provides a "road-map" of the inputs which should be reviewed for that problem. This path does not cross any vertical lines. A symbol with an equal sign indicates that the symbol should be input to have the indicated value. With the significant input symbols identified, the input sheets may be used to record the values of the desired inputs. Depending on the options selected, some input sheets will not be used at all.

For all problems which involve the comparison of a reentry vehicle with one or more decoys, at least two "cases" are required. A "case" is defined as the input quantities appearing before a "transfer card". The transfer card (See Sample Inputs) has a "1" in the first column to indicate that the program is to stop reading input data and start calculating. The first of the required cases accomplishes the process of storing the reentry vehicle data for later comparison (IREF = 1 or 3). The second case, with IREF = 2, involves the calculation of the performance of the decoys and their comparison with the stored reentry vehicle data. The influence coefficient calculations of the MØDE = 2 option require a third case to define the perturbation effects and influence coefficients. Single trajectory calculations, drag calculations, and classic check calculations require only one case. It is generally necessary to trace a path through Figure 3 for each case being submitted.

2.2 Special Restrictions on the Input

The drag calculations in this program were designed to apply to the following body parameters and flight conditions:

PARAMETER	PRIMARY RANGE	SECONDARY RANGE
1. Cone half angle, Θ, deg.	4. to 27.	4 to 40. degrees
2. Vehicle length, inches	12. to 168.	3. to 168.
3. Surface Temperature, $^{\circ}$R	1000.to6000	———
4. Bluntness ratio, R_N/R_B	0.0 to 0.6	———
5. Altitude, ft.	0. to 400K	———
6. Free-stream Mach number	5. to 30.	———
7. Angle of Attack at 300K, deg less than 150K, deg	0.to 20. 0.to Θ	———
8. Flight Path Angle, deg.	-90 to 0.0	———

The primary range represents the region of most accurate calculations, while the secondary range shows the region where the program will produce results with perhaps degraded accuracy. If the bluntness ratio changes from below 0.6 to above 0.6 during a trajectory calculation as the result of nose shape change, the calculations will be terminated. If the Mach number becomes less than 5.0 the calculations will also be terminated.

Provisions are made in the program to bypass the trajectory calculations temporarily if an optimizer attempts to evaluate a decoy outside the limits shown in Table 1. These provisions assume that the starting configuration (See ØVECT, ALØW, UP, etc.) are within the limits shown in Table 1. The optimization processes may go unstable if this restriction is not complied with.

The restrictions on the number of entries in the input tables are indicated in the Definition of Input Symbols and in some cases on the input sheets. The restrictions on the order of the independent variable(s) for the tables are difficult to generalize. In many cases the table-look-up subroutines are designed to interpolate the data in either ascending or descending monotonic order; however, this has not been confirmed by checkruns. The preset deck and the sample check cases illustrate the conventional order for most of the tables. The remaining tables, unless otherwise noted in the Definition of Input Symbols, should be input in the order that the data is used in the calculations, independent of whether the independent variable is increasing or decreasing. Note, particularly that the definitions of the independent variables for the thrust variables, THDELZ or THDELT, are <u>differences</u> from the initiation parameters.

These definitions allow a given thrust profile to be moved up or down the trajectory, by inputting different initiation parameters, without having to transform the independent variables for each case. The corridor altitudes, H, must start and stop at the same altitudes as the calculations, although the intermediate values do not have to correspond to the printout altitudes. The trajectory input entries in the ZPLØT table must correspond to all the printout altitudes.

Note that the heatshield material is described separately for the trajectory calculations and the wake calculations. There is no internal check on the consistency of the two sets of inputs.

2.3 Stacked Case Groundrules

A series of cases in a job are said to be "stacked". The inputs for cases stacked after the first need special consideration. This program has been designed to retain the most current input for use at the beginning of each stacked case (with the exception of the large table, HH). This means that once an input quantity has been input, it does not have to be input again in following cases if the same value is desired. The preset values listed in the Definition of Input Symbols do not apply to quantities which have been input in previous cases of the current job. Considerable coding effort has been required to maintain this system of stacking cases. As a general rule, the program is not allowed to permanently redefine the value of any input quantity. In cases where it is desirable to redefine an input quantity, the input value is stored, the quantity redefined temporarily, and then the stored value is put back for use in the next case, if no new input supersedes. This technque must be understood when interpreting "core dumps". The HH matrix was judged

too large to save, thus it is an exception to the above discussion. If Davidon techniques using the input HH matrix are to be stacked, then the HH matrix must be input for every case or else the final HH matrix from the previous case will be used.

Trajectories must not be stacked after classic checkruns (ICØM(1) = 1) unless the values of the A vector which have been input for the classic check cases are reinput equal to the values in subroutine ZPRS.

Note that only the first IN values of the initial configuration table ØVECT are used. If IN is smaller in one case than it was in the previous case, care must be taken to enter the values of the remaining design variables under their own symbol names.

There are no serious restrictions on the options which may be stacked as long as the input is complete. The last of a series of reference reentry vehicle cases will be used for comparison with subseqeunt decoys. In the MØDE = 2 option where three cases are required, the last of a series of reference reentry vehicles and the last of a series of basic decoys will be used for comparison with the perturbation decoys. However, it is not considered wise to run perturbation decoys immediately after a reference reentry vehicle without at least one basic decoy in between.

Within a case, if a symbol is entered more than once, the last value entered will be used in the calculation.

2.4 Input Aids

The definitions of the IØP input matrix are contained in Table 2. The eight operations are listed across the top and the nine performance parameters are listed down the side. A value of zero deletes the operation and a value of one executes the operation if possible. Note that numbers 1 to 21 are preset to one and the others to zero.

The current list of design variables and design variable constraints is shown in Table 3. Although ZTURN is a design variable, it is not considered suitable for automatic optimization since it is only tested at printout altitudes and thus may not provide a continuous penalty function. It can of course be a parameter in a parametric study.

The storage locations (ØCCUR codes) for the calculated quantities which may need to be constrained are presented in Table 4. Up to 20 of these code numbers may be entered in the IDC constraint list to become part of the penalty equation.

The use of probability of discrimination (code 3962) can involve numerical troubles if the value of the probability of discrimination is very near zero or very near one. The error function used to define probability of discrimination (subroutine EFFECT) is coded to produce roughly 16 significant digits. Whenever more digits are needed the probability is set to either zero or one. This precludes any trend information for use by the optimizers and can lead to unstable results. An alternative is provided whereby the "difference in the means, σ" (code 3965) can be constrained or minimized instead of the probability of discrimination and thus avoid the significant digits problem. For searches in a narrow region where the range of values of the probability of discrimination are known in advance, either approach can be used.

Some of the possible input symbols are not used for typical operational problems. Table 5 presents a list of symbols which are not included on the input sheets.

The Euler angle system and the thrust orientation definitions are shown in Figures 4 and 5.

3.0 DEFINITION OF INPUT SYMBOLS

INPUT SYMBOLS

SYMBOL	PRESET	COMMON	REMARKS
A(1-514)	ZPRS	301	Curve-fit constants used primarily in the trajectory calculations. If ICØM(1) = 1, the first 26 can be used in CLASSC.
AA(1-3)	0.,0.,1.	CPCCUR	Coefficients of the altitude weighting function for the velocity corridor integral.
AA(4-6)	0.,0.,1.	CPCCUR	Coefficients of the altitude weighting function for the deceleration corridor integral.
AA(7-9)	0.,0.,1.	CPCCUR	Coefficients of the altitude weighting function for the ballistic coefficient corridor function.
AA(10-12)	0.,0.,1.	CPCCUR	Coefficients of the altitude weighting function for the first wake length corridor function.
AA(13-15)	0.,0.,1.	CPCCUR	Coefficients of the altitude weighting function for the second wake length corridor function.
AA(16-18)	0.,0.,1.	CPCCUR	Coefficients of the altitude weighting function for the third wake length corridor function.
AA(19-21)	0.,0.,1.	CPCCUR	Coefficients of the altitude weighting function for the first wake RCS corridor function.
AA(22-24)	0.,0.,1.	CPCCUR	Coefficients of the altitude weighting function for the second wake RCS corridor function.
AA(25-27)	0.,0.,1.	CPCCUR	Coefficients of the altitude weighting function for the third wake RCS corridor function.
ACØE(1-140)	0.0	CPCCUR	Polynomial coefficients used in MISC to define either free space radar cross section of the decoys as functions of three design variables or to compute any constraint which can be expressed as a polynomial function of up to three variables. The orders of the polynomial are controlled by ICØM (4-6).
ACØN	1.0	NIMPUT	Exponent for scale factor, $(CC\O N)^{ACON}$, on transition electron density, N_{et}, FLOWF.

SYMBOLS	PRESET	COMMON	REMARKS
AE	0.0	214	Thruster nozzle exit area for back pressure correction, ft^2.
AKW	50.0	NIMPUT	Heatshield conductivity for wake calculations, BTU/(ft-°R-hr).
ALPTBL (1-75)	0.0	3646	Input angle of attack table for use in drag calculations if INALPH is greater than zero, degrees.
ALØW(1-20)	0.0	MIN	Lower limits for independent (or design) variables in Fibonacci searches.
ALST	0.2	122	Value of the envelope angle of attack for switching from a rotational to a particle trajectory, degrees.
AMULT (1-20)	0.0	MIN	Multipliers for each term of the penalty equation. These should be selected to avoid very large or very small penalty terms. They may be used to "weight" various penalty terms if desired. These numbers influence the choice of ERR when IPRØC is 3.
AWREF	0.0	188	Reference area for the drag components in the table WCDTAB, ft^2.
B(1-21)	ZPRS	823	Curve-fit coefficients in the trajectory calculations. These numbers are not normally input; however, it is possible to do so for research or debugging purposes.
BCB(1-40)	0.0	CPCCUR	Lower corridor limits for ballistic coefficient differences lb/ft^2.
BCØN	1.0	NIMPUT	Exponent for scale factor, $(CCØN)^{BCØN}$, on the decay rate, b_1, in FLØWF.
BCD(1-40)	0.0	CPCCUR	Lower corridor limits for deceleration differences, g's.
BCV(1-40)	0.0	CPCCUR	Lower corridor limits for velocity differences, ft/sec.
BCWL1(1-40)	0.0	CPCCUR	Lower corridor limits for the first wake length differences, meters.
BCWL2(1-40)	0.0	CPCCUR	Lower corridor limits for the second wake length differences, meters.

SYMBOL	PRESET	COMMON	REMARKS
BCWL3(1-40)	0.0	CPCCUR	Lower corridor limits for the third wake length differences, meters.
BCWR1(1-40)	0.0	CPCCUR	Lower corridor limits for the first wake RCS differences, m^2 or db. depending on IDBL.
BCWR2(1-40)	0.0	CPCCUR	Lower corridor limits for the second wake RCS differences, m^2 or db. depending on IDBL.
BCWR3(1-40)	0.0	CPCCUR	Lower corridor limits for the third wake RCS differences, m^2 or db. depending on IDBL.
BETA11	0.0	152	Sublimation rate coefficient for initial heat-shield material if MATLN1 is 6, ft/sec - ^oR.
BETA12	0.0	171	Sublimation rate coefficient for heatshield material after ZTURN if MATLN2 is 6, ft/sec - ^oR.
BETA21	0.0	153	Sublimation rate coefficient for initial heat-shield material if MATLN1 is 6, ft/sec - ^oRBETA31
BETA22	0.0	172	Sublimation rate coefficient for heatshield material after ZTURN if MATLN2 is 6, ft/sec - ^oRBETA32
BETA31	0.0	154	Order of reaction for initial heatshield material if MATLN1 is 6.
BETA32	0.0	173	Order of reaction for heatshield material after ZTURN if MATLN2 is 6.
BETA41	0.0	155	Activation temperature for initial heatshield material if MATLN1 is 6, ^oR.
BETA42	0.0	174	Activation temperature for heatshield material after ZTURN if MATLN2 is 6, ^oR.
BETAPL (1-160)	0.0	CPCCUR	Table of ballistic coefficient inputs for reference R/V if IREF is 3, lb/ft^2.
BETAZ(1-10)	-	CWAKE	Atmospheric density scale height for wake calculations. The first two values are preset to 22.0 thousands of feet.

SYMBOL	PRESET	COMMON	REMARKS
BTWEN	1.0	DRCSEC	Scaling constant in RCSEC, b_{20}.
BZERØ	5.8E-21	DRCSEC	Scaling constant in RCSEC, b_o.
B2	4.0E-10	DRCSEC	Scaling constant in RCSEC, b_2.
B3	2.0	DRCSEC	Scaling constant in RCSEC, b_3.
B21	1.0	NIMPUT	Scaling constant in FLØWF, b_{21}.
B22	0.25	NIMPUT	Scaling constant in FLØWF, b_{22}.
B23	0.0	NIMPUT	Scaling constant in FLØWF, b_{23}.
B24	1.0E-26	DRCSEC	Scaling constant in RCSEC, b_{24}.
C	1.0	115	Multiplier on stagnation point heating in the nose blunting calculations which can be used to simulate a decoy having a nosecap made of a different material from the main body.
CALØW (1-20)	0.0	MIN	Lower bounds for constrained items in the penalty equation.
CAPG	32.21852	19	Graviatioanl acceleration, ft/sec^2.
CASE	0.0	128	Case number. Note that 0.001 will be added internally to the input number for each trajectory calculated when MØDE is 2 or 3.
CCØN	1.0	3963	Scale factor for transition electron density and decay rate in the wake calculations in FLØWF. This scale factor may be used as a design variable to roughly simulate wake-seeding concepts.
CDØWN (1-16)	1.0E-5	3549	Lower limits on accuracy of integrated quantities in the equations of motion. If the absolute value of the quantity being integrated is less than or equal to 1, the limits are equal to the inputs with the units listed below. If the absolute value is greater than 1, the limits are equal to the inputs (non-dimensional) times the absolute value of the quantity being integrated. 1 Velocity, ft/sec. 2 Flight path angle, rad. 3 Time, sec.

SYMBOL	PRESET	COMMON	REMARKS
CDØWN (1-16)	1.0E-5	3549	4 Range (downrange), ft. 5 Initial weight minus weight ablated, lb. 6 Nose radius, ft. 7 Base radius, ft. 8 Euler angle in yaw, rad. 9 Euler angle in pitch, rad. 10 Euler angle in roll, rad. 11 Pitch rate, rad/sec. 12 Yaw rate, rad/sec. 13 Roll rate, rad/sec. 14 Side range, ft. 15 Thrust direction, rad. 16 Initial weight minus weight expelled by thruster, lb.
CDTAB (1-75)	0.0	3383	Table of drag coefficients which will supercede the calculated drag coefficients if MAKCD is greater than zero.
CHIGH (1-16)	1.0E-4	3533	Upper bounds on accuracy of integrated quantities in the equations of motion. See CDØWN for identification of the 16 items.
CMQIN1	0.0	124	Input pitch damping coefficient for initial configuration if IKCMQ is 1.
CMQIN2	0.0	125	Input pitch damping coefficient for configuration after ZTURN if IKCMQ is 1.

SYMBOL	PRESET	COMMON	REMARKS
CNE	0.0	DRCSEC	Transition electron density when non-linear production terms are considered in the turbulent wake. The item should be left at 0.0 in this model.
CNUMB (1-169)	-	NIMPUT	General constants used in the wake calculations. The quantities currently being utilized are preset in the preset deck.
CPG1	0.0	161	Specific heat of gas for initial heatshield material if MATLN1 is 6, BTU/lb°R.
CPG2	0.0	180	Specific heat of gas for heatshield material after ZTURN if MATLN2 is 6, BTU/lb°R.
CP21	0.0	160	Specific heat of solid for initial heatshield material if MATLN1 is 6, BTU/lb°R.
CP22	0.0	179	Specific heat of solid for heatshield material after ZTURN if MATLN2 is 6, BTU/lb°R.
CRHØW	0.75	NIMPUT	Heatshield specific heat used in the wake calculations, BTU/lb °R.
CTP(1-20)	0.0	MIN	Upper bounds for constrained items in the penalty equation.
DATE	0.0	127	Date, for example: 814.68 means August 14, 1968.
DELHC1	0.0	166	Heat of decomposition for initial heatshield material if MATLN1 is 6, BTU/lb.
DELHC2	0.0	185	Heat of decomposition for heatshield material after ZTURN if MATLN2 is 6, BTU/lb.
DELIN	-2000.	187	Maximum integration interval (altitude) for the initial integrations of the equations of motion, ft.
DELRH1	0.0	159	Difference between the virgin and char density of the initial heatshield material if MATLN1 is 6, lb/ft^3.
DELRH2	0.0	178	Difference between the virgin and char density of the heatshield material after ZTURN if MATLN2 is 6, lb/ft^3.

SYMBOL	PRESET	COMMON	REMARKS
DELTA	1.0	FØPT	Estimate of the determinant of the initial H matrix (input as HH) in the Davidon method. If FAC is not zero, then input DELTA = FAC^{IN}. This input is for printout only and does not affect the optimization process.
DELWH	0.01	NIMPUT	Heatshield thickness for wake calculations, in.
DELX (1-20)	0.001	DØPT	In the Davidon Method, finite difference increments; in the Rosenbrock Method, the initial step sizes. For use with the Davidon Method, these terms should be smaller than the anticipated minimum step size but large enough to obtain a meaningful gradient.
DELY	0.0	219	Linear component of thrust offset in the Y direction, in.
DELZ	0.0	220	Linear component of thrust offset in the Z direction, in.
DHCHEM	0.0	NIMPUT	Chemical enthalpy of the heatshield for the wake calculations, ft^2/sec^2.
DNBNDZ	0.0	248	Lower altitude limit for tabular input atmosphere, ft.
DSB	0.0	DRCSEC	Additional wake radar cross section due to consideration of non-linear production terms in the turbulent wake. This item should be left at 0.0 in this model.
DTABL (11,5,4)	PRESET	TBLS12	Electron density as a function of normalized enthalpy, ratio of ablation to boundary layer air, and air density for 1000 PPM sodium seed for wake calculations,e/cm.
DVH(1-50)	0.0	CPCCUR	Input values of design variables for second perturbations of comparison decoys (MØDE = 2).
DVL(1-50)	0.0	CPCCUR	Input values of design variables for first perturbations of comparison decoys (MØDE = 2).
DX	50.	DRCSEC	Numerical step size used in finding the wake length, meters.

SYMBOL	PRESET	COMMON	REMARKS
EMCTBL (1-12)	PRESET	TBLS12	Cone Mach number, independent variable for wake Mach number table, ETABL.
ENTABL (25,9)	PRESET	TBLS12	Table of electron density as a function of normalized enthalpy, HSTABL, and air density, RSTABL.
EPSIL1	0.0	167	Coefficient of emission for initial heatshield material if MATLN1 is 6.
EPSIL2	0.0	186	Coefficient of emission for heatshield material after ZTURN if MATLN2 is 6.
ERNRTB (1-10)	PRESET	TBLS12	Air density, independent variable for normal shock electron density, ERNTBL, lb/ft^3.
ERNTBL (8,10)	PRESET	TBLS12	Normal shock electron densityas function of density, ERNRTB, and velocity, ERNUTB, e/cc.
ERNUTB (1-8)	PRESET	TBLS12	Velocity, independent variable for normal shock electron density table, ERNTBL, thousands of feet per second.
ERR	0.01	FØPT	If IPRØC = 3 (Davidon), ERR is the stopping tolerance on the transformed gradient; if IPRØC = 1 or 5 and LIMIT = 0, the accuracy requirement for the Fibonacci search in the physical units of the independent variables.
ETABL (12,11)	PRESET	TBLS12	Mach number as a function of cone Mach number, EMCTBL and cone angle THTTBL.
FAC	1.0	FØPT	If non-zero, multiplier of the identity matrix to establish the initial H matrix in the Davidon Method for each sequential solution - finding operation; if zero, the input HH matrix will be used instead.
FGSM	4.0	NALTFG	Multiplier on the maximum step size limit, f/gs, in the Davidon method.
FRQ1	4.35E8	CWAKE	First radar frequency for wake calculations, cps.
FRQ2	1.375E9	CWAKE	Second radar frequency for wake calculations, cps.
FRQ3	5.4E9	CWAKE	Third radar frequency for wake calculations, cps.

SYMBOL	PRESET	COMMON	REMARKS
F1	0.0	157	Heat of ablation for the initial heatshield material if MATLN1 is 6, BTU/lb.
F2	0.0	176	Heat of ablation for the heatshield material after ZTURN if MATLN2 is 6, BTU/lb.
G	32.174	27	Conversion factor, lb/slug.
GAMFO	0.0	105	Initial flight path angle (Note that this quantity must be input as a negative number to obtain meaningful results), degrees.
GAMMA	1.4	28	Ratio of specific heats for air.
H (in column 1)	—	—	Heading information, can be in any format which can be keypunched.
H(1-40)	0.0	CPCCUR	Altitudes for the corridor tables and radar measurement errors, BCV, TCV, etc. and SV, SD, SB, etc. The initial value in this table should be equal to ZO and the NCPth value should be equal to ZST. The other (NCP-2) values must be monotonic but do not have to correspond in any way with the printout altitudes.
HH(40,40)	-	BLKØ	Upper right triangular input of the initial elements of the Davidon H matrix if FAC is zero. Note that this input is modified by the Davidon process and that the input values are not saved. This means that the modified matrix is carried over to the next sequential solution-finding operation or to the next case if FAC is zero. Only the first IN rows and columns are used.
HREF1	0.0	156	Combustion ablation constant for initial heatshield material if MATLN1 is 6.
HREF2	0.0	175	Combustion ablation constant for heatshield material after ZTURN if MATLN2 is 6.
HSTABL (1-25)	PRESET	TBLS12	Normalized enthalpy, independent variable for electron density table ENTABL.

SYMBOL	PRESET	COMMON	REMARKS
FTAB(1-75)	0.0	3233	Altitude table, independent variable for either drag coefficients, CDTAB, or angles of attack, ALPTAB, depending on MAXCD and INALPH.
IATMØS	0	NØCCUR	Input atmosphere option code and indicator for the number of entries in the altitude table, TBATMZ. If IATMØS is zero, the 1962 standard atmosphere will be used.
ICØM(1)	0	IXCØM	Option controlling the use of the full trajectory calculation (0) or the use of the classic check case subroutine (1).
ICØM(2)	0	IXCØM	Not currently used.
ICØM(3)	0	IXCØM	Input code used in REDUCE to distinguish between the cases where an input quantity is being optimized (0) and an output quantity is being optimized (1). For example, if weight is to be minimized, ICØM (3) should be input equal to zero; but if probability of discrimination is to be minimized, then ICØM(3) should be input equal to one.
ICØM(4)	1	IXCØM	One more than the order of the first variable in the polynomial in MISC. If the polynomial is to be quadratic in the first variable, then input ICØM(4) equal to 3.
ICØM(5)	1	IXCØM	One more than the order of the second variable in the polynomial in MISC.
ICØM(6)	1	IXCØM	One more than the order of the third variable in the polynomial in MISC. Note that there are ICØM(4)* ICØM(5)* ICØM(6) coefficients (ACØE) required for the polynomial.
ICØM(7)	136	IXCØM	ØCCUR subscript identifying the first variable in the polynomial in MISC.
ICØM(8)	135	IXCØM	ØCCUR subscript identifying the second variable in the polynomial in MISC.
ICØM(9)	134	IXCØM	ØCCUR subscript identifying the third variable in the polynomial in MISC.
ICØM(10)	0	IXCØM	Input option control for normal definition of ballistic coefficient, W/C_DA, (0); or for the definition of an apparent ballistic coefficient including thrust, $W/(C_DA - T/q)$, (1), or for the reciprocal of the apparent ballistic coefficient, (2). These are experimental options and should only be used cautiously.

SYMBOL	PRESET	COMMON	REMARKS
ICØM (11-200)	0	IXCØM	Not currently used.
IDBL	4	CICCUR	Input code controlling the units of the wake radar cross section for output; if 3, RCS in decibels; if 4, RCS in square meters. Note that the corridors and standard deviation inputs must be in compatible units; however, the inputs SIGNL1, 2, and 3 are always input in square meters.
IDC(1-20)	0	IDNØS	ØCCUR subscripts identifying the terms desired in the penalty equation. The first entry, IDC(1), must be the quantity to be optimized if LRED is greater than zero. See Table 4.
IDC (21-50)	0	IDNØS	Not currently used.
IDNØ(1-20)	0	IDNØS	ØCCUR subscripts identifying the independent or design variables for the search. See Table 3.
IDNØ (21-50)	0	IDNØS	Not currently used.
IEX	2	IØPT	The exponent of the terms in the penalty equation.
IGDH(1-20)	0	IGDHL	ØCCUR subscripts defining the first terms in the general differences in subroutine MISC. A zero in this table will terminate the general difference calculations.
IGDL(1-20)	0	IGDHL	ØCCUR subscripts defining the second terms in the general differences in subroutine MISC. A zero in this table will terminate the general difference calculations.
IKCMQ	0	NØCCUR	Option code for pitch damping derivative, C_{m_q}, use calculated derivative if 0 and input value if greater than 0. This code applies both before and after ZTURN.
IN	1	IØPT	The number of design variables to be used. This should be 1 for IPRØC = 1 and 2 for IPRØC = 5. It is equal to the number of entries in the IDNØ and ØVECT tables. There must be at least one entry for all problems where MØDE = 3 and IREF = 2.

SYMBOL	PRESET	COMMON	REMARKS
INALPH	0	NØCCUR	Option code for an input angle of attack for use with a particle trajectory (LØPT = 1). If INALPH is 0 and LØPT = 1, zero angle of attack will be used. If the input angle of attack is desired, INALPH must equal the number of entries in the ALPTAB table. Note that if INALPH is greater than zero and LØPT= 0 or 2, then the ALPTAB inputs override and the rotational calculations are not performed. Note that MAXCD and INALPH must not both be greater than zero.
IND	0	CWAKE	Printout option control for wake flowfield calculations: 0, no printout; 1, printout at every altitude point where wake calculations are performed.
IND2	0	DRCSEC	Printout option control for wake radar cross section calculations: 0, no printout; 1, printout at every altitude point where wake radar cross section calculations are performed.
IØP(1-90)	See below	CICCUR	Option control matrix for various operations for the nine performance functions. The definitions are summarized in Table 2.
IØP(1-21)	1	CICCUR	Controls for trajectory performance functions.
IØP (22-63)	0	CICCUR	Controls for wake performance functions. Some of these must be set to 1 if wake calculations are desired for the reference reentry vehicle. At least one must be turned on for each of the six performance parameters to be evaluated.
IØP (64-75)	—	CICCUR	These quantities are used internally. No input has any influence.
IØP(76)	—	CICCUR	Plotter option control which must be 1 at Avco and 0 at Aerospace (See subroutine AVPLT for details).
IØP(77-82)	0	CICCUR	Controls for wake plots of the wake parameter (not the difference) versus altitude.
IØP(83-90)	0	CICCUR	Not used.
IPNT	—	IØPT	Input option for future use in FEV. Not currently used.
IPRØC	1	IØPT	Optimizer selection code: 1 One-variable Fiboracci search 2 (One decoy evaluation) 3 Davidon Variable Metric Method for Minimization

SYMBOL	PRESET	COMMON	REMARKS
			4 Rosenbrock Rotating Coordinate Method 5 Two-variable Fibonacci search
IRAND	0	IØPT	Davidon input for number of random starting points to be automatically used. This input should be left at 0 since the random number subroutine is not implimented and because the use of this option would conflict with the optimization technique if LRED is greater than zero.
IREF	1	CICCUR	Trajectory processing option code; 1, calculate R/V trajectory or other miscellaneous calculations; 2, calculate and compare decoy trajectories or use classic check case functions; 3, input set of R/V data for comparison with decoy data.
ISEN1	0	SENSE	Davidon printout control.
ISEN2	0	SENSE	Davidson printout control for future use.
ISP	1.0	222	Specific impulse of the thruster
ITAPE	0	NØCCUR	Option for a tape output for velocity, ballistic coefficient, and altitude for use as input to other Avco programs; 0, no tape output; 1, tape output.
ITHRST	0	NØCCUR	Number of entries in the thrust table, THTHO. Maximum value is 25.
IWAKE	2	CWAKE	Number of entries in the wake-altitude table, WKALT. Maximum value is 10.
IWPRNT	0	CWAKE	Printout option in WAKE subroutine; 0, no printout; 1, printout at each altitude.
K	0	MINSK	Not currently used.
LAMDA1	0.0	137	Bluntness ratio (R_N/R_B) for initial configuration.
LAMDA2	0.0	143	Bluntness ratio for configuration after ZTURN.
LA1	0.0	138	Axial length for initial configuration, in.
LA2	0.0	144	Axial length for configuration after ZTURN, in.
LIMIT	30	IØPT	Counter limit for the various optimizers: A. IPRØC = 1. a. LIMIT greater than zero. The number of times the function will be calculated is LIMIT + 1. b. LIMIT equal to zero. This input has no effect and the accuracy requirement, ERR, will control the number of calculations of the function.

SYMBOL	PRESET	COMMON	REMARKS
			B. IPRØC = 2. This input is not used. C. IPRØC = 3. LIMIT is the maximum number of iterations for the Davidon method. An iteration is the total process of selecting a direction, bracketing the minimum in that direction, and locating that minimum. D. IPRØC = 4. Maximum number of successful steps allowed along any one coordinate. E. IPRØC = 5 a. LIMIT greater than zero. The number of times the function will be calculated is $(LIMIT)^2 + 1$. b. LIMIT equal to zero. This input has no effect and the accuracy requirement, ERR, will control the number of calculations of the function for each variable.
LØPT	1	NØCCUR	Trajectory option code: 0, rotational trajectory; 1, particle trajectory; 2, simplified angle of angle attack trajectory; 3, input flight conditions for drag calculation; 4, input wind tunnel conditions for drag calculations.
LPLØT	1	CICCUR	Number of entries in the table ZPLØT of R/V input data. This number must agree with the number of altitude points produced in the decoy calculations by ZPR1, ZBAR, ZPR2, ZST, and TST. Maximum value is 160.
LRED	0	ØWL	Maximum number of times that the factor WRF can be applied in the optimization process.
MATIN1	1	NØCCUR	Code for initial heatshield material: 1 Teflon 2 LT_{α} 3 OTWR 4 Phenolic Nylon 5 Carbon Phenolic 6 Use input material properties
MATIN2	1	NØCCUR	Code for heatshield material after ZTURN. See MATIN1 list above for definitions.

SYMBOL	PRESET	COMMON	REMARKS
MAXCD	0	NØCCUR	Code for drag options in the trajectory calculation; 0, calculate the drag and do not use the drag input in CDTAB, greater than zero, do not calculate the drag but use the drag input in CDTAB plus perhaps the drag in WCDTAB depending on MAXWCD. If MAXCD is greater than zero, it must be equal to the number of entries in CDTAB. Maximum value is 75. Note that MAXCD and INALPH must not both be greater than zero.
MAXVAL	0	NØCCUR	Number of entries in the TRAJT table if LØPT is 3 or the number of entries in the WTZ table if LØPT is 4. Maximum value is 75.
MAXWCD	0	NØCCUR	Number of entries in the table for added drag coefficient values, WCDTAB. If zero, no drag will be added. Maximum value is 75.
MEMØ	0.0	129	Memo number which can be used to identify the job, example: 1032.4.
MHEAT	0	NØCCUR	Heating and mass loss code: 0, Aerodynamic heating only (if MØPT = 1) 1, Heating and mass loss (if MØPT = 1)
MØDE	3	CICCUR	Fundamental option code which allows direct access to certain subroutines to simulate existing Avco programs. 1 Single trajectory calculations, or drag calculations without trajectories (simulates Avco program 2269) 2 Comparisons of R/V and decoy performance and influence coefficients. 3 Maximum capability with optimization searches.
MØPT	0	NØCCUR	Heating and mass loss code: 0 No heating or mass loss 1 Test MHEAT
MW	28.9	117	Molecular weight of air, gram/mole.
MXTAB1	1	NØCCUR	Number of entries in mass properties table, TABZ1. Maximum value is 50.
MXTAB2	1	NØCCUR	Number of entries in mass properties table, TABZ2. Maximum value is 50.

SYMBOL	PRESET	COMMON	REMARKS
NALT	0	NALTFG	Code for alternate step size logic in Davidon method (subroutine READY): 0 Select a new direction after an undershoot (normal) 1 Double the step size and continue in the same direction after an undershoot (alternate).
NCØMDV (1-50)	133	CICCUR	ØCCUR subscripts identifying the design variables to be perturbed during the influence coefficient calculations of MØDE = 2 option. The same subscripts may be entered more than once if desired.
NCØNS	1	IØPT	Number of entries in the constraint table, IDC. This is also the number of terms in the penalty equation. Maximum value of 20.
NCP	1	CICCUR	Number of entries in each of the altitude, H, corridor and standard deviation tables. Maximum value of 40.
NDECØY	1	CICCUR	Code controlling the perturbations for influence coefficients of the MØDE = 2 options. NDECØY must be equal to 1 for all other options. 1 R/V or one basic decoy 2 One perturbation of each design variable 3 Two perturbation of each design variable
NDVCH	1	CICCUR	Number of entries in the design variable table, NCØMDV. Maximum value of 50.
NGEØM	1	NØCCUR	Geometry input code indicating which parameters are being input. 1 Nose radius, base radius, and cone angle 2 Base radius, cone angle, and bluntness ratio 3 Nose radius, base radius, and length Note that this code applies to both the initial configuration and to the configuration after ZTURN. This input must be compatible with the design variables listed in IDNØ if MØDE is 3 or those listed in NCØMDV if MØDE is 2, IREF is 2, and NDECØY is 2 or 3.
NGL1	0.0	164	Laminar transpiration factor of gas for the initial heatshield material if MATIN1 is 6.

SYMBOL	PRESET	COMMON	REMARKS
NGL2	0.0	183	Laminar transpiration factor of gas for the heat-shield material after ZTURN if MATLN2 is 6.
NGT1	0.0	165	Turbulent transpiration factor of the gas for the initial heatshield material if MATLN1 is 6.
NGT2	0.0	184	Turbulent transpiration factor of the gas for the heatshield material after ZTURN if MATLN2 is 6.
NØSEØP	0	NØCCUR	Shape-change option for noseblunting and decreasing base radius. 0 no shape change 1 shape change (if MØPT and MHEAT are 1)
NPA	1	CICCUR	Number of entries in the altitude counter table, NPV, for plots of performance variables versus design variables at fixed altitudes for MØDE = 2 option. Maximum value of 160.
NPLØT(1-5)	-	——	Plotter codes. These are overridden during the gradient calculations in subroutine FCN to reduce the number of plots produced.
NPLØT(1)	0	NØCCUR	Code for drag coefficient plots: 0 No plots 1 $C_{D_{total}}$ vs. Z $C_{D_P} + C_{D_B}$ vs. M C_{D_F} vs. Z C_{D_I} vs. Z
NPLØT(2)	0	NØCCUR	Code for trajectory plots: 0 no plots 1 BETA vs. Z V vs. t M vs. t $\dot{V}/g$ vs. t Z vs. t q_{dyn} vs. t

SYMBOL	PRESET	COMMON	REMARKS
NPLØT(3)	0	NØCCUR	Code for pressure and heating plots: 0 no plots 1 $W_{total}/W_{initial}$ vs. Z P_S vs. t H_S/RT_o vs. t $\dot{q}_{stag}$ vs. t $\dot{q}_8$ vs. t for $\lambda \neq 0$: $\dot{q}_{sonic}$ vs. t $\dot{q}_7$ vs. t
NPLØT(3)	0	NØCCUR	Code for envelope angle of attack versus time plots: 0,no plots; 1,plot.
NPLØT(5)	0	NØCCUR	Code for a generalized plot which allows any quantity in the ØCCUR array to be stored at each printout altitude and plotted versus time. Note that the use of this option requires some understanding of the arrangement and units of the data during the execution of the trajectory calculations. An input of 0 indicates no plot and an input of the appropriate ØCCUR subscript indicates that a plot should be made.
NPRINT	1	NØCCUR	Printout control for detailed trajectory data. 0 No detailed trajectory printout except for solutions and final decoys. 1 Detailed trajectory printout for every trajectory
NPV(1-160)	1	CICCUR	Index of altitudes for plots of performance variables versus design variables in MØDE = 2 option. This index is a list of numbers identifying the altitudes at which plots are desired. The altitudes are numbered according to the order in which they are printed out. The initial altitude (Z_o) is 1, the next printout altitude (Z_o - ZPR) is 2, etc.
NSL1	0.0	162	Laminar transpiration factor of solid for initial heatshield material if MATIN1 is 6.
NSL2	0.0	181	Laminar transpiration factor of solid for heatshield material after ZTURN if MATIN2 is 6.
NSTWL	100	DRCSEC	Maximum number of rough sizing steps allowed in the wake length calculations.

SYMBOL	PRESET	COMMON	REMARKS
NST1	0.0	163	Turbulent transpiration factor of solid for initial heatshield material if MATLN1 is 6.
NST2	0.0	182	Turbulent transpiration factor of solid for heatshield material after ZTURN if MATLN2 is 6
NTHRUST	0	NØCCUR	Thrusting option code: 0 no thrust 1 thrust as a function of delta altitude 2 thrust as a function of delta time
ØCCUR (1-4000)	-	1	Input symbol allowing input directly to the ØCCUR array for research or debugging purposes.
ØVECT (1-20)	5.0	ØWL	Starting values of the design variables for IPRØC equal to 2,3, or 4. This defines the first configuration for the search processes. Note that the Fibonacci searches do not use this input. Units must be compatible with the normal input units.
PFD	0.03	CPCCUR	Probability of false dismissal of the reentry vehicle as a decoy. Also called α or P_F.
PHIO	0.0	112	Initial value of roll Euler angle, degrees. (see figure 4.)
PHI1(1-10)	6.,6.	CWAKE	Look angle for radar of the first frequency, degrees.
PHI2(1-10)	6.,6.	CWAKE	Look angle for radar of the second frequency, degrees.
PHI3(1-10)	6.,6.	CWAKE	Look angle for radar of the third frequency, degrees.
PRAND	0.0	FØPT	Random step size control for Davidon technique. This input is not used as long as IRAND is 0.
PSIZET	0.0	223	First thrust offset angle (in X-Y plane, positive for right hand rotation), degrees (see Figure 5)
PSIO	0.0	114	Initial value of yaw Euler angle, degrees. (see Figure 4).
PO	0.0	109	Initial angular rate in roll, rad/sec.
QO	0.0	110	Initial angular rate in pitch, rad/sec.
R	53.5	57	Gas constant for air, ft.-lb./lb_m-^oR.
RB1	0.0	136	Initial base radius for the initial configuration, inches.

SYMBOL	PRESET	COMMON	REMARKS
RB2	0.0	142	Initial base radius for the configuration after ZTURN, inches.
RE	2.090229E7	63	Radius of the earth, feet.
RHØ21	0.0	158	Char density for the initial heatshield material if MATIN1 is 6, lb/ft^3.
RHØ22	0.0	177	Char density for the heatshield material after ZTURN if MATIN2 is 6, lb/ft^3.
RHØSL	0.08042	NIMPUT	Sea level density for exponential atmosphere approximations in the wake calculations, lb/ft^3.
RHØW	115.0	NIMPUT	Heatshield density for wake calculations, lb/ft^3.
RN1	0.0	135	Initial nose radius for the initial configuration, inches.
RN2	0.0	141	Initial nose radius for the configuration immediately after ZTURN, inches.
RSTABL(1-9)	PRESET	TBLS12	Normalized density, independent variable for electron density table, ENTABL.
RTO	8.475E5	NIMPUT	Reference enthalpy for wake calculations, ft^2/sec^2.
SB(1-40)	0.0	CPCCUR	Standard deviation of radar errors for ballistic coefficient, lb/ft^2. This table of NCP values corresponds to the altitude table H.
SD(1-40)	0.0	CPCCUR	Standard deviation of radar errors for deceleration, g's. This table of NCP values corresponds to the altitude Table H.
SIG	3.5	116	Collision cross section for air, angstroms.
SIGNL1	1.0E-6	CWAKE	Noise level for wake length definition at first frequency, m^2.
SIGNL2	1.0E-6	CWAKE	Noise level for wake length definition at second frequency, m^2.
SIGNL3	1.0E-6	CWAKE	Noise level for wake length definition at third frequency, m^2.
SMRO			Initial angular rate in roll, rad/sec.
SMULT(1-25)	1.0	MULT	Multipliers of special penalty terms in subroutine SCREEN for research and debugging purposes.

SYMBOL	PRESET	COMMON	REMARKS
SRS(1)	40.0	CPCCUR	Number of smoothed radar measurements of velocity.
SRS(2)	40.0	CPCCUR	Number of smoothed radar measurements of deceleration.
SRS(3)	40.0	CPCCUR	Number of smoothed radar measurements of ballistic coefficient.
SRS(4)	40.0	CPCCUR	Number of smoothed radar measurements of wake length at 1st frequency.
SRS(5)	40.0	CPCCUR	Number of smoothed radar measurements of wake length at 2nd frequency.
SRS(6)	40.0	CPCCUR	Number of smoothed radar measurements of wake length at 3rd frequency.
SRS(7)	40.0	CPCCUR	Number of smoothed radar measurements of wake RCS at 1st frequency.
SRS(8)	40.0	CPCCUR	Number of smoothed radar measurements of wake RCS at 2nd frequency.
SRS(9)	40.0	CPCCUR	Number of smoothed radar measurements of wake RCS at 3rd frequency.
SV(1-40)	0.0	CPCCUR	Standard deviation of radar errors for velocity, ft/sec. This table of NCP values corresponds to the altitude table H.
SWL1(1-40)	0.0	CPCCUR	Standard deviation of radar errors for wake length at the first frequency, m. (See H, NCP).
SWL2(1-40)	0.0	CPCCUR	Standard deviation of radar errors for wake length at the second frequency, m. (See H, NCP)
SWL3(1-40)	0.0	CPCCUR	Standard deviation of radar errors for wake length at the third frequency, m. (See H, NCP).
SWR1(1-40)	0.0	CPCCUR	Standard deviation of radar errors for wake RCS at the first frequency, units depend on IDBL. (See H, NCP).
SWR2(1-40)	0.0	CPCCUR	Standard deviation of radar errors for wake RCS at the second frequency, units depend on IDBL. (See H, NCP).
SWR3(1-40)	0.0	CPCCUR	Standard deviation of radar errors for wake RCS at the third frequency, units depend on IDBL. (See H, NCP)

SYMBOL	PRESET	COMMON	REMARKS
TABIX1 (1-50)	1.0,0.0	3033	Table of roll moments of inertia, for initial shape, slug - ft^2.
TABIX2 (1-50)	1.0,0.0	3083	Table of roll moments of inertia for the configuration after ZTURN, slug - ft^2.
TABI1(1-50)	1.0,0.0	2933	Table of pitch-yaw moments of inertia for initial shape, slug - ft^2.
TABI2(1-50)	1.0,0.0	2983	Table of pitch-yaw moments of inertia for the configuration after ZTURN, slug - ft^2.
TABL	1500.0	NIMPUT	Ablation temperature (°K) for the heatshield in the wake calculations. Note the difference in units from TW1, TWST, TINIT, etc.
TABRHØ (1-50)	0.0	3771	Tabular input freestream density, lb/ft^3.
TABSND (1-50)	0.0	3821	Tabular input freestream speed of sound, ft/sec.
TABZ1 (1-50)	0.0	3133	Altitudes for mass properties tables for initial shape, ft.
TABZ2 (1-50)	0.0	3183	Altitudes for mass properties tables for the configuration after ZTURN, ft.
TAU1	1.0	CWAKE	Pulse length for radar of first frequency, μ sec.
TAU2	0.4	CWAKE	Pulse length for radar of second frequency, μ sec.
TAU3	0.4	CWAKE	Pulse length for radar of third frequency, μ sec.
TBATMZ (1-50)	0.0	3721	Table of atmosphere altitudes for use with TABRHØ and TABSND. This table must be input with the lowest (smallest) altitude first.
TCB(1-40)	0.0	CPCCUR	Upper corridor for differences in ballistic coefficient in lb/ft^2. Note that the NCP values in this table correspond to the altitudes, H. The sign convention for the corridors is a source of possible confusion. The difference itself is defined as the R/V parameter minus the decoy parameter. Thus a positive difference (upper side of corridor) implies that the R/V parameter is larger than the decoy parameter. However, if the R/V and decoy parameters were plotted, the decoy parameters would then be below the R/V, while on the difference plots the decoy data would be above the axis. The upper corridor is defined as the R/V parameter minus the <u>minimum</u> allowable value for the decoy.

SYMBOL	PRESET	COMMON	REMARKS
TCD(1-40)	0.0	CPCCUR	Upper corridor for differences in deceleration, g's. (See TCB).
TCRIT	0.0	77	Angle of attack cycle time test parameter, sec. Recommended value is 1.0E-5.
TCV(1-40)	0.0	CPCCUR	Upper corridor for differences in velocity, ft/sec. (See TCB).
TCWL1(1-40)	0.0	CPCCUR	Upper corridor for difference in wake length at the first frequency, meters. (See TCB).
TCWL2(1-40)	0.0	CPCCUR	Upper corridor for differences in wake length at the second frequency, meters. (See TCB).
TCWL3(1-40)	0.0	CPCCUR	Upper corridor for differences in wake length at the third frequency, meters. (See TCB).
TCWR1(1-40)	0.0	CPCCUR	Upper corridor for differences in wake RCS at the first frequency. Units depend on IDBL (See TCB).
TCWR2(1-40)	0.0	CPCCUR	Upper corridor for differences in wake RCS at the second frequency. Units depend on IDBL. (See TCB).
TCWR3(1-40)	0.0	CPCCUR	Upper corridor for differences in wake RCS at the third frequency. Units depend on IDBL. (See TCB).
TECØN	2.0	78	Angle of attack cycle time test parameter, sec. Recommended value is 1.0E-5.
THO	0.0	207	Multiplier for the thrust table which can be considered as a reference thrust level in pounds to be multiplied times the non-dimensional values in the thrust table, THTHO, or alternatively it can be considered as a percentage throttling control to be multiplied times the thrust in pounds in the thrust table.
THDELT (1-25)	0.0	3618	Change in time from the thrust onset time, TØN, sec. This table is used only if NTHRUST is 2. (See THDELZ)
THDELZ (1-25)	0.0	3593	Change in altitude from the thrust onset altitude, ZØN, ft. This table is used only if NTHRUST is 1. A thrust table running from a ZØN at 3000000.0 ft. to 50000.0 ft. would have THDELZ(1) equal to 0.0 for the high altitude thrust and THDELZ (NTHRST) equal to 250000.0 for the low altitude thrust.

SYMBOL	PRESET	COMMON	REMARKS
THEALO	0.0	113	Initial pitch Euler angle, degrees. (See Figure 4).
THETA1	0.0	134	Cone half angle for initial configuration, degrees.
THETA2	0.0	140	Cone half angle for the configuration after ZTURN, degrees.
THEZET	0.0	224	Second thrust offset angle (in modified Z-X plane, positive for right hand rotation), degrees. (See Figure 5).
THTHO (1-25)	0.0	3568	Thrust table corresponding to THDELZ or THDELT depending on NTHRUST. The units of the table can be non-dimensional or pounds, opposite to the units chosen for THO.
THTTBL (1-11)	PRESET	TBLS12	Cone half angle, independent variable for wake Mach number table, ETABL, degrees.
TINIT	500.0	132	Internal temperature of the vehicle for ablation calculations, °R.
TØFF	0.0	209	Time for thrust termination, sec.
TØN	0.0	208	Time for thrust initiation, sec.
TPLØT (1- 160)	0.0	CPCCUR	Table of times for the input R/V trajectory data. This table is not currently used in the calculations but it can be useful for bookkeeping purposes and it may be required for future modifications of the program.
TRAJRN (1-75)	0.0	1644	Nose radius table for drag calculations (LØPT = 3), inches. This table must be input for this option in addition to RN1.
TRAJT (1-75)	0.0	1344	Time table for LØPT = 3 drag calculations, sec. This table affects only the integrated heating.
TRAJV (1-75)	0.0	1494	Velocity table for LØPT = 3 drag calculations, ft/sec.
TRAJW (1-75)	0.0	1569	Weight table for LØPT = 3 drag calculations, lb. This table must be input for this option in addition to W1.
TRAJZ (1-75)	0.0	1419	Altitude table for LØPT = 3 drag calculations, ft.
TRJALP (1-75)	0.0	1719	Angle of attack table for LØPT = 3 drag calculations, degrees.
TRZTR	0.0	243	Input transition altitude and option code, ft. If this input is greater than zero then the input altitude overrides the calculated transition altitude.

SYMBOL	PRESET	COMMON	REMARKS
TST	100.0	123	Trajectory stopping time, seconds
TWST	580.0	148	Effective wall temperature used in free molecule drag calculations, ^{o}R.
TW1	1200.0	149	Wall temperature at onset of continuum flow for ablation and drag calculations, ^{o}R. (See TABL).
TW2	1200.0	168	Wall temperature for ablation and drag calculations at ZTURN (or at onset of continuum flow if lower), ^{o}R. (See TABL).
TXCGD1 (1-50)	0.0	2833	Table of center of gravity/diameter for initial configuration.
TXCGD2 (1-50)	0.0	2883	Table of center of gravity/diameter for configuration after ZTURN.
TO	0.0	102	Initial trajectory time, seconds.
UP(1-20)	—	MIN	Upper limits for independent (or design) variables in Fibonacci searches.
UPBNDZ	0.0	247	Upper altitude boundary on use of tabular input atmosphere, ft.
VPLØT (1-160)	0.0	CPCCUR	Table of velocities for input R/V trajectory, ft/sec.
VO	0.0	106	Initial velocity, ft/sec.
VOGPLT (1-160)	0.0	CPCCUR	Table of deceleration ($\dot{V}/g$) for input R/V trajectory g's. Note that the sign convention is actually for acceleration. Increasing velocity is positive, decreasing velocity is negative.
WCDTAB (1-75)	0.0	3458	Total drag coefficient table for use in overriding the calculated drag.
WHTAB (1-75)	0.0	3308	Altitude table, ft. Independent variable for added drag table WCDTAB.
WKALT (1-10)	5.E5,0.	CWAKE	Altitude table, ft. Independent variable for scale height,BETAZ,and look angles,PHI1, PHI2, and PHI3.
WL1P (1-160)	0.0	CPCCUR	Table of wake length at first frequency for input R/V trajectory, meters.
WL2P (1-160)	0.0	CPCCUR	Table of wake length at second frequency for input R/V trajectory, meters.

SYMBOL	PRESET	COMMON	REMARKS
WL3P (1-160)	0.0	CPCCUR	Table of wake length at third frequency for input R/V trajectory, meters.
WRF	0.9	ØWL	Factor for reducing the critical constraint or input design variable after each successful solution-finding-process in order to achieve an optimum.
WR1P (1-160)	0.0	CPCCUR	Table of wake RCS at first frequency for input R/V trajectory. Units must be consistant with IDBL input for the decoy calculations.
WR2P (1-160	0.0	CPCCUR	Table of wake RCS at second frequency for input R/V trajectory. Units depend on decoy IDBL.
WR3P (1-160)	0.0	CPCCUR	Table of wake RCS at second frequency for input R/V trajectory. Units depend on decoy IDBL.
WSTALT	1.8E5	CWAKE	Maximum altitude for wake calculations, ft.
WTMINF (1-75)	0.0	1119	Mach number table for LØPT = 4 drag calculations.
WTPTØT (1-75)	0.0	1269	Total pressure table for LØPT = 4 drag calculations, lb/ft^2.
WTRINF (1-75)	0.0	1194	Reynold's number per inch table for LØPT = 4 drag calculations, 1.0/in.
WTZ (1-75)	0.0	1044	Altitude table for LØPT = 4 inputs, ft.
W1	0.0	133	Initial total weight for the initial configuration, lb.
W2	0.0	139	Total weight of the configuration immediately after ZTURN, lb.
XCØM(1)	3.0	IXCØM	Multiplier on step size after a successful step in Rosenbrock procedure.
XCØM(2)	0.5	IXCØM	Multiplier (magnitude) on step size after an unsuccessful step in Rosenbrock procedure.
XCØM(3)	0.5	IXCØM	Multiplier times the total successful steps during a stage to obtain the initial step size for the next stage.

SYMBOL	PRESET	COMMON	REMARKS
XCØM(4)	0.01	IXCØM	One of the Rosenbrock stopping requirements. The function magnitudes of the last two stages must be within XCØM(4) times the third from last magnitude in order to stop.
XCØM(5)	0.5	IXCØM	One of the Rosenbrock stopping requirements. The ratio of difference between the last and next to last function to the difference between the third from last and second from last function must be less than XCØM(5) in order to stop.
XCØM(6)	1.0E-4	IXCØM	A step will be called a success in the Rosenbrock process if the function is less than or equal to (1. + XCØM(6)) times the previous value of the function. Note that this definition allows the process to become unstable on constant or very flat functions if XCØM(6) is positive.
XCØM(7)	1.0	IXCØM	The value for the R/V bare body radar cross section for comparison with the decoy cross section calculated from the polynomial with coefficients ACØE.
XCØM(8)	1.0	IXCØM	Multiplier on the result of the polynomial with coefficients ACØE.
XCØM (9-200)	0.0	IXCØM	Not currently used.
XDTABL (1-11)	PRESET	TBLS12	Normalized air density. Independent variable for electron density table DTABL.
XLØW	4.0	238	The value of the interaction parameter defining the lower boundary of the fairing region between strong interaction and continuum flow regimes.
XRO	0.0	107	Initial range, ft.
XUP	6.0	237	The value of the interaction parameter defining the upper boundary of the fairing region between strong interaction and continuum flow regimes.
X1LØW	0.2	240	The value of the rarefaction parameter defining the lower boundary of the fairing region between the free molecule and strong interaction flow regimes.
X1UP	0.4	239	The value of the rarefaction parameter defining the upper boundary of the fairing region between free molecule and strong interaction flow regimes.

SYMBOL	PRESET	COMMON	REMARKS
X2BØD	0.0	DRCSEC	Two-body overdense length in wake radar cross section calculations. This input should be left at 0.0 in this model.
X3B	0.0	DRCSEC	Station where linear production terms first dominate the non-linear production terms in the wake radar cross section calculations. This input should be left at 0.0 in this model.
YDTABL (1-11)	PRESET	TBLS12	Normalized enthalpy table. Independent variable for electron density table, DTABL.
ZBAR	-1.0E5	120	Altitude at which printout altitude changes, ft. Note that there must not be more than 160 printout altitudes.
ZDTABL (1-11)	PRESET	TBLS12	Ablation to boundary layer air mass flow ratio table. Independent variable for electron density table, DTABL.
ZETA	0.9	93	Accommodation Coefficient
ZNUS	2.0E11	DRCSEC	Sea level collision frequency for wake calculations, CPS.
ZØFF	0.0	206	Altitude of thrust termination if NTHRUST is 1.
ZØN	0.0	205	Altitude of thrust initiation if NTHRUST is 2.
ZPLØT (1-160)	0.0	CPCCUR	Altitude table for the input R/V trajectory data. These altitudes must correspond to the decoy printout altitudes defined by ZPR1, ZBAR, ZPRZ, ZO, and ZST.
ZPR1	1.0E4	118	Initial printout altitude increment, ft. Note that there must not be more than 160 printout altitudes.
ZPR2	0.0	119	Printout altitude increment after ZBAB, ft. Note that there must not be more than 160 printout altitudes
ZST	0.0	121	Trajectory stopping altitude, ft. Note that the program stops all processing if the Mach number goes below Mach 5 before the vehicle reaches the altitude ZST. (also see H.)

SYMBOL	PRESET	COMMON	REMARKS
ZTURN	-1.0	145	Altitude at which a discontinuous change in the vehicle's configuration and/or weight and/or material is to be made, ft. The new configuration after ZTURN must be completely defined by the input. Changes of heatshield material at ZTURN may not be compatible with the wake calculations. The tests for the ZTURN operation are only made at printout events, thus small changes in ZTURN do not produce continuous results. A negative ZTURN indicates that no discontinuous shape change ' to take place. The screening subroutine (SCREEN) ı . ires that ZTURN not be less than -10.0.
ZO	0.0	108	Initial altitude, feet. It is intended that the trajectories by initiated et 3000000.0 feet or above. Trajectories starting below this altitude may have numerical difficulties.

4.0 Description of the Input Sheets

The 20 different input sheets which have been prepared for this program are included in Appendix 1. Certain infrequently used input symbols (Table 5) do not appear on these sheets. A typical memo will contain more than one copy of some inputs and no copies of others. The selection of the input sheets depends on the options being used. The symbols on a given sheet tend to be in groups corresponding to a particular option.

The first input sheet of Appendix 1 is associated with the selection of the search technique, definition of the design variables, and definition of the penalty function. Control data for the search techniques are also included. This sheet contains the primary inputs required to operate the classic check cases.

The second input sheet contains additional control data for the Davidon search technique on the top half and input data for the functions in Subroutine MISC on the botton half.

The third input sheet contains the corridor tables, standard deviation tables, and control codes for the processing of the trajectory performance data and the first wake length performance data.

The fourth input sheet contains similar input provisions for the remaining wake performance data.

The fifth input sheet is associated with the inputs required for the wake calculations. Both the inputs for the wake flow field and the wake radar response are included on this sheet. When this input sheet is used for the reference reentry vehicle, be sure that some IØP codes for wake calculations are one and that the IDBL code for the units is set properly. (See sample input discussion).

The sixth input sheet contains the trajectory initial conditions, stopping parameters, and printout controls.

The seventh input sheet provides for the definition of the vehicle and the analysis options desired.

The eighth input sheet contains the trajectory plotting controls, the tape output control, and the trajectory printout control, along with some physical constants used in the trajectory calculations.

The ninth input sheet provides for the input of the reentry vehicle performance data for comparison with decoys in some later case. These inputs are associated with the option where MØDE is equal to 2 or 3 and IREF is equal to 3. The use of this option involves the risk that the reentry vehicle data and the decoy data are being produced from different models and that the apparent differences in performance may really be differences in prediction techniques. Note that the altitudes in the ZPLØT table must correspond to the decoy printout altitudes in the following cases. No interpolations are performed on this input data. Only the performance quantities to be compared with the decoy data are required to be input along with the altitude table.

The tenth input sheet is associated with the influence coefficient calculations of the MØDE = 2 option. This input sheet typically defines the third case of a memo where the first case is a reference reentry vehicle, IREF = 1, the second case is a basic decoy, IREF = 2 and NDECOY =1, and the third case provides for perturbations of the specified design variables of the basic decoy to obtain the partial derivatives of the performance variables with respect to the design variables.

The eleventh input sheet allows for the calculated drag to be superseded by an input drag table, and/or allows for an added increment of drag to be added to either the calculated or input drag.

The twelfth input sheet provides for thrust as a function of either time after initiation or the absolute value of the altitude change after initiation. The thrust is provided as a multiplier, THO, times an input table, THTHO.

The thirteenth input sheet allows an angle of attack history to be input for use with particle trajectories so that the angle of attack effects on the drag can be included approximately.

The fourteenth input sheet is for use in providing new heatshield material ablation properties.

The fifteenth input sheet allows an input atmosphere table to override the 1962 Standard Atmosphere between the specified altitudes. Exponential interpolation is used for the density table. Note the restrictions on the order of the inputs in the tables.

The sixteenth input sheet allows the preset accuracy controls for the predictor-corrector integration subroutine to be modified. The smoothness and continuity of the penalty function as well as some aspects of the running time depend on these parameters.

The seventeenth and eighteenth input sheets provide access to the drag calculations for free-stream conditions defined in terms of wind tunnel parameters. This option is not used in conjunction with trajectory or optimization calculations.

The nineteenth and twentieth input sheets provide similar access to the drag calculations for freestream conditions defined in terms of flight parameters. This option is not used in conjunction with trajectory or optimization calculations. Note that this option should not be confused with the IREF = 3 "trajectory input options" on the ninth input sheet.

5.0 Description of Sample Problem Inputs

The sample problems consist of eight cases illustrating a number of different options and capabilities of the program. The first three cases demonstrate the primary operations of evaluating a reference reentry vehicle's performance, optimizing a decoy configuration, and evaluating a single decoy's performance. The last five cases demonstrate the use of classic check cases to provide inexpensive tests of the correctness of the program. The input sheets for these eight check cases are included in Appendix 2.

The first three input sheets define the first case which is the evaluation of a reentry vehicle's trajectory and wake characteristics. The first input sheet provides for identification data and for the definition of the initial and final trajectory conditions. The printout code is set to zero to delete the detailed trajectory output.

The second input sheet defines the weight and geometry of the reentry vehicle along with the heatshield material and analysis options.

The third input sheet provides the inputs necessary to control the wake calculations for the reentry vehicle. Note that the IØP codes numbered 34 and 37 are set equal to one to indicate that the wake length and wake RCS at the first frequency are to be calculated. This indirect means is required in order to get the wake calculations executed for the reentry vehicle. This completes the required inputs for the reentry vehicle. A "transfer card" having a "1" in the first column is inserted at the end of each case to indicate that the program should stop reading input cards and begin to execute the calculations.

The second case, consisting of input sheets 4 through 7, provides an example of a decoy optimization problem. This problem includes results from all the ADTECH IV tasks. The problem is to determine the lightest weight decoy (and its corresponding base radius and length) which is within three specified corridors and is compatible with four geometric constraints. The probability of discrimination based on specified radar measurement errors, number of samples, and probability of false dismissal is to be calculated and printed out. For this example, the minimum weight is to be determined within 20 percent.

The fourth input sheet identifies the beginning of Case 2.0 and specifies that the Rosenbrock Rotating Coordinate Optimizer is to be used. The base radius and length are identified as the design variables with starting values of 2.5 and 20.0 inches respectively. The first entry in the constraint table identifies the quantity to be minimized. The lower and upper bounds are set so that there will be no contribution to the penalty equation. Since it is weight, which is an input quantity, the code ICØM(3) is left at zero. The next three constraints are the corridor functions. These have multipliers to reduce the numerical values of the corridor function to reasonable levels. Geometric constraints on the base radius, length, cone angle, and bluntness ratio are specified in the next four entries in the constraint table. The last two entries provide for the "difference in the means" and the probability of discrimination to be printed out; however, they will not contribute to the value of the penalty function because their multipliers (AMULT) are set to zero. This illustrates the use of one of the more subtle output controls. Note that this sheet controls the

optimizers and the penalty function equation but does not control the actual calculations in the trajectory, observables, and effectiveness subroutines. The options and required input data for these calculations must be input to produce the quantities implied on this sheet. There is no automatic connection between the penalty function equation and the actual calculations in the function evaluator .

The fifth sheet provides for the trajectory program to work with base radius and length (NGEØM = 3) and includes the input weight and nose radius for the decoy. This weight number will be changed in the program during the optimization process. The decoys have the same initial and final conditions and heatshield material as the reentry vehicle, so no other inputs are required. Note that the printout intervals must be the same for the reentry vehicle and decoy, thus they are not input again for the decoy. The wake calculations are to be under the same groundrules, so the wake input data are not repeated.

The sixth and seventh input sheets define the number of entries in the tables being used, the corridors and radar errors, the number of radar samples, the probability of false dismissal and the option codes which provide for the appropriate effectiveness integrals and corridor integrals to be calculated. The number of smoothed radar samples of the wake SRS (4) and SRS (7), are actually equivalent to a value of 0.391 since the effectiveness function is only calculated over a 90000 feet interval (160K to 70K)while the altitude difference in the effectiveness equations is 230000 feet (300K to 70K). This completes the inputs required to define a reference reentry vehicle and a minimum weight decoy. The remaining input sheets illustrate other features of the program.

The eighth input sheet provides for the evaluation and comparison of a single decoy with the reference reentry vehicle. This case is set up to evaluate and plot the data corresponding to the 20.48 pound decoy determined in case 2.0.

The ninth input sheet (Case 4.0) illustrates the inputs for a classic check case using the Rosenbrock Method on a quadratic function of two variables.

The tenth input sheet (Case 5.0) illustrates the inputs for the same problem using the Davidon method. This problem is initiated with FAC equal to 1.0 so the input sheet for the HH matrix is not required.

The eleventh input sheet (Case 6.0) shows a two-variable Fibonacci search of the same function between the limits of ± 10.0 for each variable.

The twelfth input sheet (Case 7.0) provides a constrained check case where the objective is to determine the smallest value of the second design variable which is compatible with the value of the function being between 0.0 and 1.1.

The thirteenth input sheet (Case 8.0) provides a check case for the one-variable Fibonacci optimizer. The second design variable is set equal to 1.0 and the first design variable is varied to locate the minimum of the function.

A listing of the input cards is shown at the end of Appendix 2 in order to illustrate the actual input formats. Note the transfer cards which are at the end of each case. The final "END OF JOB" card and the slash-asterisk card indicate that there are no more cases in this job.

Within a case, if the same input symbol is used more than once, the last input will be used. If an attempt is made to imput a symbol which is not contained in the list of input symbols for this program, the run will be terminated immediately.

6.0 Description of the Output

The primary printed output from the sample problems is reproduced in Appendix 3. The output from cases 1 and 3 through 8 are reproduced in their entirety and the output from case 2 has been edited to show the beginning of the search, the optimum, and the end of the search. The plots produced by these sample problems are reproduced in Appendix 4. These outputs correspond exactly to the inputs described in Section 5.0 and Appendix 2.

The sample problems were executed at the Avco Computer Center using an IBM 360/65 computer and a SC-4020 plotter. The first twelve pages are produced by the system to show the control cards and the memory map for the program. Note that these runs utilize the Avco plotter package which contains a large number of subroutines. When other plotter packages are used, such as the Aerospace PLT package, the list of subroutines marked with asterisks will change considerably.

6.1 Trajectory Printout

The preset input data is shown on the next 3 pages along with the input data for Case 1.0. The heading card identifying the case is on the next page. This is followed by the main output from the first case. This consists of the case, date, memo, and program numbers (where the case number has been incremented by 0.001), a title identifying this output as that of a reference reentry vehicle, a description of the vehicle design parameters, and a summary table of the trajectory and wake calculations. The code, LP, at the end of the design variables is an output of the trajectory calculations. If LP is 6, the calculations have failed to run to completion. The subroutine ADM4RK uses this code to indicate the manner in which the integration process concluded. All values except 6 are considered

normal. The results of the wake calculations are presented for the radar cross section (WAKE R1) and the wake length (WAKE L1) at the first frequency. The wake calculations were started at 160000 feet altitude, thus the values printed out above that altitude are artificial.

The inputs for case 2.0 are shown on the next page. This is followed by the title information on the next page. The title "Case 2.001" identifies the initial decoy in the search for a minimum weight decoy within the stated constraints. The initial decoy weighs 40.0 pounds, has a 0.10 inch nose radius, a 2.5 inch base radius, and a 20. inch length, as was requested on the input sheet. The trajectory and wake calculations are shown below the design variable information in the same format as the reentry vehicle. The second page of case 2.001 shows a number of values of diagnostic information. The corridor integral for velocity is 1.5×10^7 ft^2/sec and the decoy left the velocity corridor at 113269. feet altitude. The effectiveness integral for velocity is 6.7×10^5. The printout showing the two wake corridor integrals to be 0.0 indicates that this decoy is within both wake corridors. The printout starting with "MISC" shows the results of some of the calculations in Subroutine MISC. Since the discontinuous shape change option, ZTURN, is not being used, those parameters which were designed for comparing the vehicle before and after shape change are not of interest. The average density of the vehicle, W1/V1, might be of interest if internal packaging problems are anticipated.

The table starting with "IZ" is of particular interest since it summarizes the constraints and provides a means for identifying those constraints which are active and those which are not active. The code

numbers, lower bounds, and upper bounds are taken directly from the inputs IDC, CALØW, and CTP. The values listed under ØCCUR(IZ) are the actual values of the quantities being constrained. Each of the terms in the penalty equation are listed under "PENALTY". In this case, the decoy meets all the requirements except for the velocity corridor. The penalty term for being out of the velocity corridor is 2.36×10^9. The probability of discrimination is 0.3219 as shown at the bottom of the ØCCUR(IZ) list. The line beginning "*FEV*" contains the total of the penalty terms, called F, and the values of the active design variables, called X. This is the information which allows the search to proceed. The function evaluator has been given the two design variables and it has determined the value of the function to be 2.36×10^9. The remaining output is diagnostic data from subroutine RØSBRK which indicates that the first trial of the first design variable of the zeroth stage has not yet lead to a successful step and the value of the function is U. Here, the 2.36×10^9 is too large for the programmed format and asterisks are substituted. The first values labeled P(I) are the current design variables, the values labeled DP(I) are the changes to these variables to obtain the design variables for the next trial which are printed out under the label P(I). The quantity E(N) is the current step size in the rotated coordinate system. This output indicates that the next decoy will have a base radius of 2.6 inches with a 20 inch length.

This decoy is evaluated in Case 2.002. It is found that it has a penalty function value of 1.98×10^9 which is an improvement over the previous 2.36×10^9. The next decoy will have a base radius of 2.9 inches, which has a penalty of 9.16×10^8 as shown in Case 2.003. Case 2.004 shows

continued improvement with increasing base radius; however, in case 2.005 the base radius has been made too large. For case 2.006 the base radius is set back to the best value so far (3.8 inches used in Case 2.004) and the length is increased to 21 inches. This combination of base radius and length produces a decoy which meets every one of the constraints. The value of the function is zero.

The detailed printout for this decoy (Case 2.007) has been edited from Appendix 3 along with Cases 2.008 through 2.025. After case 2.007 the factor WRF = 0.8 is applied to the weight and another search is conducted to determine if there is some combination of base radius and length which will allow a 32.0 pound decoy (0.8 x 40.0) to meet all the constraints. The search started with the base radius of 3.8 inches and the length of 21 inches; however, this decoy was out of the velocity corridor. In case 2.013, a 32 pound decoy with a base radius of 3.6 inches and a length of 22 inches was found to be acceptable. Case 2.014 provided a detailed printout for this decoy.

The weight was reduced to 25.6 pounds (0.8 x 32) and the search was continued until a solution was found at a base radius of 3.2 inches and a length of 23 inches in case 2.025. The detailed output for this decoy was produced in case 2.026 which is included in Appendix 3.

The details of the trajectory, drag, configuration, pressure, heating, and mass loss data are provided for each printout altitude. The definitions of these quantities are provided in Table 6. The summary data are provided at the end of the detailed printout. It will be shown later that this decoy is the minimum weight decoy (within 20%) which meets all the constraints.

The weight is reduced to 16.38 pounds and another search is conducted for an acceptable decoy at this weight starting with the base radius of 3.2 inches and a length of 23 inches in case 2.027. A total of 30 combinations of base radius and length were evaluated at the 16.38 pound weight without finding a solution. Cases 2.028 through 2.055 are not included in Appendix 3. The RØSBRK stopping criteria were met after the 30th trial (case 2.056) which indicates that a minimum of the function has been found and that there is no acceptable solution at this weight. If there are questions regarding the possibility of multimodel functions, it would be advisable to execute another problem to determine if other starting points might lead to a solution at this weight. The summary table at the end of case 2.056 indicates that the only active penalty term is the wake length. If the requirements on this performance function (corridor) were relaxed sufficiently then this decoy would become a solution. However, for the stated problem, there is no solution at 16.38 pounds weight. Therefore the lightest acceptable decoy (within 20%) is the 20.48 pound decoy of case 2.026. This decoy is therefore the optimum.

If it were desired to obtain the optimum more accurately, another problem could be executed starting with the 20.48 pound solution and utilizing a reduction factor, WRF, of perhaps 0.90 or 0.95.

It is interesting to note that four solution-finding problems (40, 32, 25.6, and 20.48 lbs) were conducted in 26 cases while it took 30 cases to prove that there was no solution at 16.38 pounds. Comparisons of this type have discouraged the use of more conventional root-finding methods in Subroutine REDUCE.

In general, no manual data reduction is required since the detailed trajectory output is provided for the optimum decoy (case 2.026 in this problem). Because of the expected length of case 2, the plotter was not utilized. The next case illustrates how a single given decoy might be evaluated and how plots are produced. The decoy utilized in case 3.0 is the same as the one in case 2.026. Note that in general one would not have foreknowledge of the results of case 2.0 when determining the inputs for case 3.0; however, case 2.0 had been run previously in checkout and the solution was known.

Case 3.0 provides a summary output for a single decoy. In addition to the trajectory and wake output, the tables for the differences and corridors are also printed out for each corridor parameter. The plots produced by this case are shown in Appendix 4.

6.2 Plotter Output

The first frame in Appendix 4 is an identification frame produced only at Avco. The total drag coefficient, C_D, versus altitude is shown in Frame 2 while the pressure and base drag coefficient, skin friction coefficient and induced drag coefficient are shown in Frames 3, 4, and 5, respectively. The ballistic coefficient is shown as a function of altitude in Frame 6 while the velocity, Mach number, deceleration, altitude, and dynamic pressure are shown as functions of time in Frames 7-11 respectively. The total decoy weight as a fraction of the initial weight is shown versus altitude in Frame 12. Frames 13-21 contain time histories of data related to the aerodynamic heating. Frame 13 is the stagnation pressure in atmospheres, while Frame 14 is the normalized stagnation enthalpy. Frames 15-18 are the heating rates at the stagnation

point, sonic point, station 7, and station 8, respectively. Frames 19-21 show the pressures normalized by stagnation pressure for the tangent point, station 7, and station 8 respectively. The wake length in meters is shown in Frame 22 and the wake radar cross section in decibels in Frame 23. The velocity corridors and the differences between the reentry [illegible] are shown in Frame 24. In this case the decoy is slower than the reentry vehicle throughout the trajectory. The corridors for the wake length are shown in Frame 25 and for wake RCS in Frame 26. The "END OF JOB" shown in Frame 27 is produced at Avco to separate jobs and to positively indicate that all plots written on the tape have been plotted by the plotter.

6.3 Classic Check Case Printout

Cases 4 through 8 illustrate inexpensive check cases used to verify the operation of the four search methods and the technique of reducing a parameter to obtain an optimum. Selected portions of the output from these cases have been manually plotted in Figures 6-10.

Case 4.0 illustrates the operation of the Rosenbrock Method in an unconstrained optimization mode. A total of 35 trials organized in 4 stages (coordinate systems) are required to obtain the optimum and meet the stopping criteria. Eleven selected trials are shown in Figure 6 to illustrate the coordinate rotations and general pattern of the trials. The locations of the 35 trials are labeled "X" in the printout.

Case 5.0 contains the Davidon solution for the same problem. The locations of the trials are shown in Figure 7. At each of the points labeled in the figure, three evaluations of the function are performed

in order to evaluate the gradient at each point. The coordinates are labeled "X" in the printout and the gradient is labeled "G". A total of 16 trials are performed. This illustrates the efficiency of the Davidon method on quadratic functions.

Case 6.0 contains the two-variable Fibonacci solution for the same function where the search is conducted between values of the independent variables of ± 10.0. Twelve points are used for each variable for a total of 144 evaluations of the function plus 1 evaluation for final printout. Six of the locations are shown for each variable in Figure 8. The points labeled 1-5 show the technique of fixing the value of X_2 while finding the best value of X_1. Next, the value of X_2 is changed and the points 13-17 are evaluated. This process is continued until the interval of uncertainty around the optimum has been reduced to the amount implied by the use of 12 points. The final (145th) printout is the best of the previous 144 trials. Note that the last of the group of 12 trials (or the last of the 144) is not necessarily the optimum.

Case 7.0 contains a rather long check case somewhat analogous to the problem solved in Case 2.0. The problem here is to find the minimum value of X_2 and the corresponding value of X_1 which is within the constraint of the function being not greater than 1.1. The Rosenbrock Method is used to vary both X_1 and X_2 until an acceptable value of the function is obtained. The constraint on X_2 is tightened and the search is repeated. This process is illustrated in Figure 9 where the constraints are labeled "C_i". In the printout, the current value of the constraint is the first value under the label "UPPER BOUND". The trial counter, NTRIA, starts over for each new value of the constraint and the coordinate system returns to a system parallel to the initial one. The best values of X_1 and X_2

so far are used to restart the search. After it is shown that there is no acceptable solution with a constraint of 0.4519, the optimum can be identified as the last successful solution which occured when $X_1 = 1.721$, and $X_2 = 0.502$. The value of the function at this point was 1.099. The theoretical optimum is at (1.700, 0.500) with a function value of 1.100. This is considered to be good agreement.

Case 8.0 illustrates the one-variable Fibonacci search using 12 points. The locations of the first 5 points are shown in Figure 10. Note that X_2 has been set to 1.0 and that the search is for the best value of X_1 between the limits ± 10.0.

The last case is followed by the "END OF JOB" card and two pages of systems output. The running time of these 8 cases plus the time required to load in the program was 19.25 minutes on the IBM 360/65 using overlay techniques. The corresponding time for the IBM 360/75 without overlay was 11.15 minutes using the binary program on magnetic tape. Slightly shorter time will be expected when using the binary program from the disk. The major part of the running time is used by Case 2.0 which may be bypassed by removing the transfer card immediately before the card punched "case 3.0". This provides a shorter check series requiring 5.2 minutes on the IBM 360/65 with overlay. Each trajectory is averaging about 13 seconds running time on the 360/65. Changes in the printout intervals or the number of performance parameters will change this number. Roughly 3 minutes are required to load the program into the core.

TABLE 1

SUMMARY OF SCREENING LIMITS

Item	Conditions	Lower Limit	Parameter	Upper Limit	Units
1		0.0	RN1	10000.	inches
2	If ZTURN >0.0	0.0	RN2	10000.	inches
3		0.0	R_{N_1}/R_{B_1}	0.6	---
4	If ZTURN > 0.0	0.0	R_{N_2}/R_{B_2}	0.6	---
5		3.0	LA1	168.0	inches
6	If ZTURN > 0.0	3.0	LA2	168.0	inches
7		4.0	THETA1	40.0	degrees
8	If ZTURN >0.0	4.0	THETA2	40.0	degrees
9		-10.0	ZTURN	ZO	feet
10	If ZTURN >0.0	0.0	W2	W1	pounds
11	If NTHRUST ≠ 0	0.0	ISP	10000.	seconds
12	If NTHRUST = 1	ZØFF	ZØN	ZO	feet
13	If NTHRUST = 2	TO	TØN	TØFF	seconds
14	If NTHRUST = 1	ZST	ZØFF	ZØN	feet
15	If NTHRUST = 2	TØN	TØFF	TST	seconds

TABLE 2 MATRIX OF OPTION CODES, IØP

	DIFFERENCE AND CORRIDOR PLOTS VERSUS ALTITUDE	CALCULATION OF EFFECTIVENESS INTEGRALS	CALCULATION OF CORRIDOR FUNCTIONS	SLOPE PRINTOUT	DIFFERENCE TABLES PRINTOUT	INFLUENCE COEFFICIENT CALCULATIONS AND PRINTOUT	INFLUENCE COEFFICIENT PLOTS	QUANTITY PLOTS VERSUS ALTITUDE
VELOCITY	IØP (1)	4	7	10	13	16	19	SEE NPLOT
DECELERATION	2	5	8	11	14	17	20	SEE NPLOT
BALLISTIC COEFF.	3	6	9	12	15	18	21	SEE NPLOT
WAKE LENGTH FOR 1ST FREQ.	22	28	34	40	46	52	58	77
WAKE LENGTH FOR 2nd FREQ.	23	29	35	41	47	53	59	78
WAKE LENGTH FOR 3rd FREQ.	24	30	36	42	48	54	60	79
WAKE RCS FOR 1ST FREQ.	25	31	37	43	49	55	61	80
WAKE RCS FOR 2nd FREQ.	26	32	38	44	50	56	62	81
WAKE RCS FOR 3rd FREQ.	27	33	39	45	51	57	63	82

IØP(76) SHOULD BE 1 AT AVCO AND 0 AT AEROSPACE

IØP(64-75; 83-90) ARE NOT INPUTS

Table 3 Design Variables and Design Variable Constraints

ØCCUR Code No.	Item	Related Option
133	W1	
134	THETA1	NGEØM
135	RN1	NGEØM
136	RB1	—
137	LAMDA1	NGEØM
138	LA1	NGEØM
139	W2	ZTURN
140	THETA2	NGEØM, ZTURN
141	RN2	NGEØM, ZTURN
142	RB2	ZTURN
143	LAMDA2	NGEØM, ZTURN
144	LA2	NGEØM, ZTURN
145	ZTURN (Do not use)	—
205	ZØN	NTHRUST
206	ZØFF	NTHRUST
207	THO	NTHRUST
208	TØN	NTHRUST
209	TØFF	NTHRUST
222	ISP	NTHRUST
3233-3307	HTAB(1-75)	MAXCD
3308-3382	WHTAB(1-75)	MAXWCD
3383-3457	CDTAB(1-75)	MAXCD
3458-3532	WCDTAB(1-75)	MAXWCD
3568-3592	THTHO(1-25)	NTHRUST, ITHRST
3593-3617	THDELZ(1-25)	NTHRUST, ITHRST
3618-3642	THDELT(1-25)	NTHRUST, ITHRST
3963	CCØN	IØP(22-63)

Table 4 Storage Locations for Special Functions

ØCCUR Code No.	Related Option	Item
3901	ZTURN	W2-W1F, lbs
3902	ZTURN	THET2-THET1F, deg.
3903	ZTURN	RN2-RN1F, in.
3904	ZTURN	RB2-RB1F, in.
3905	ZTURN	LAMDA2-LAMD1F
3906	ZTURN	LA2-LA1F, in.
3907	ZTURN	W2/W1F
3908	ZTURN	THETA2/THET1F
3909	ZTURN	RN2/RN1F
3910	ZTURN	RB2/R31F
3911	ZTURN	LAMDA2/LAMD1F
3912	ZTURN	LA2/LA1F
3913	-	W1/V1, lb/ft^2
3914	-	W2/V2, lb/ft^2
3915	IØP(7)	Velocity Corridor Integral $\frac{ft^2}{sec}$
3916	IØP(8)	Deceleration Corridor Integral, ft
3917	IØP(9)	Ballistic Coefficient Corridor Integral, $\frac{lb}{ft}$
3918	IØP (7)	Velocity Corridor Breakthrough Altitude, ft.
3919	IØP (8)	Deceleration Corridor Breakthrough Altitude, ft.
3920	IØP (9)	Ballistic Coefficient Corridor Break-through Altitude, ft.
3921	IGDH, IGDL	General Difference, 1
3922	IGDH, IGDL	General Difference, 2
3920+I	IGDH, IGDL	General Difference, I
3940	IGDH, IGDL	General Difference, 20
3941	IØP(34), IDBL	Wake Length Corridor Integral 1, Meter^2-ft., or db-ft.
3942	IØP(35), IDBL	Wake Length Corridor Integral 2, Meter^2-ft, or db-ft.
3943	IØP(36), IDBL	Wake Length Corridor Integral 3, Meter^2-ft, or db-ft.
3944	IØP(37)	Wake RCS Corridor Integral 1, Meter-ft.
3945	IØP(38)	Wake RCS Corridor Integral 2, Meter-ft.
3946	IØP(39)	Wake RCS Corridor Integral 3, Meter-ft.
3947	IØP(34)	Wake Length 1, Corridor Breakthrough Altitude, ft.
3948	IØP(35)	Wake Length 2, Corridor Breakthrough Altitude, ft.
3949	IØP(36)	Wake Length 3, Corridor Breakthrough Altitude, ft.
3950	IØP(37)	Wake RCS 1 Corridor Breakthrough Altitude, ft.
3951	IØP(38)	Wake RCS 2 Corridor Breakthrough Altitude, ft.
3952	IØP(39)	Wake RCS 3 Corridor Breakthrough Altitude, ft.
3953	IØP(4)	Velocity Effectiveness Integral, ft.

TABLE 4 (CONTINUED)

OCCUR Code No.	Related Option	Item
3954	IØP(5)	Deceleration Effectiveness Integral, ft.
3955	IØP(6)	Ballistic Coefficient Effectiveness Integral, ft.
3956	IØP(28)	Wake Length 1 Effectiveness Integral, ft.
3957	IØP(29)	Wake Length 2 Effectiveness Integral, ft.
3958	IØP(30)	Wake Length 3 Effectiveness Integral, ft.
3959	IØP(31)	Wake RCS 1 Effectiveness Integral, ft.
3960	IØP(32)	Wake RCS 2 Effectiveness Integral, ft.
3961	IØP(33)	Wake RCS 3 Effectiveness Integral, ft.
3962	IØP(4-6,28-33)	Probability of Discrimination
3963	CCØN	Wake Seeding Design Variable
3964	XCØM(7-8), ACØE	Free Space RCS Difference
3965	IØP(4-6, 28-33)	Difference in the Means, $\sigma_{\bar{s}}$ (Subroutine EFFECT)

TABLE 5 INPUT SYMBOLS NOT INCLUDED

ON THE INPUT SHEETS

SYMBOL	REFER TO	REMARKS
B	ZPRS	For debugging only
DTABL	Preset Deck	Wake Tables
EMCTBL	Preset Deck	Wake Tables
ENTABL	Preset Deck	Wake Tables
ERMTBL	Preset Deck	Wake Tables
ETABL	Preset Deck	Wake Tables
HSTABL	Preset Deck	Wake Tables
IPNT	-	For future use in FEV
K	-	Future optimizer control
ØCCUR	-	For debugging only
RSTABL	Preset Deck	Wake Tables
THTTBL	Preset Deck	Wake Tables
XDTABL	Preset Deck	Wake Tables
YDTABL	Preset Deck	Wake Tables
ZDTABL	Preset Deck	Wake Tables

TABLE 6

DEFINITION OF DETAILED OUTPUT QUANTITIES

Translational Quantities

TIME	Flight time, seconds
Z	Altitude, feet
V	Free-stream velocity, ft/sec.
GAMF	Flight path angle, degrees
XR	Downrange component of range, feet
BETA	Ballistic coefficient, normally W/C_DA, lb/ft^2, but see the input ICØM(10).
ZTR	Altitude of the beginning of transition from laminar to turbulent flow, feet.
QD	Free-stream dynamic pressure, lb/ft^2.
MINF	Free-stream Mach number
VDOTOG	Deceleration (actually acceleration), g's.
BETAP	Partial derivative of BETA with respect to altitude, normally lb/ft^3.
TH	Total thrust value, lb.
TXT	Axial component of the thrust vector, lb.
YR	Cross-range component of range, feet.
PSIALP	Azimuth angle, degrees.
D/W	Aerodynamic contribution to the deceleration, drag/weight, g's.

TABLE 6 (cont'd)

DRAG QUANTITIES

C_D	Total drag coefficient based on base area, (AREF) and free-stream dynamic pressure, QD. In the fairing region between continuum and non-continuum flow regimes, it is not equal to the sum of the laminar flow terms.
CDP	Forebody pressure drag including angle of attack effects, if any.
CDFINF(BL,__,WB)	The skin friction drag coefficient corrected for bluntness and blowing and indicating either laminar or turbulent flow regime.
CDB	Base drag coefficient.
CDPO	Pressure drag coefficient for zero angle of attack.
CDFINF(BL,__,NB)	The skin friction drag coefficient corrected for bluntness but not blowing and indicating either laminar or turbulent flow regime.
CDI	Induced drag coefficient
XBAR	Viscous interaction parameter
REYINFLA	Free-stream Reynold's number based on axial length.
XBAR1	Hypersonic rarefaction parameter
CDI/P	Induced pressure drag coefficient
CDI/SF	Pressure induced skin friction drag coefficient
CDI/TC	Transverse curvature induced drag coefficient

TABLE 6 (cont'd)

Configuration Quantities

RN	Nose radius, inches.
THETA	Cone half angle, degrees.
LA	Axial length of vehicle, inches.
LAMBDA	Bluntness ratio, RN/RB.
AREF	Reference area for the drag coefficient, square feet. Note that the instantaneous base radius in inches is equal to $12\sqrt{\frac{AREF}{\pi}}$
W	Instantaneous weight of the vehicle.
DELW	Total change in weight from initial weight.
WABL	The weight change due to ablative mass loss.
WTHRST	The weight change due to thrust mass loss.

Heating and Mass Loss Quantities

QDOT (STAG)	Stagnation point aerodynamic heating, BTU/FT^2 sec.
QDOT (SONIC)	Sonic point aerodynamic heating, BTI/FT^2 sec.
HSRTO	Normalized stagnation enthalpy
PSPO	Stagnation pressure, atmospheres.
PEPSB	Pressure distribution P_E/P_S along the body.
QDOT	Aerodynamic heating distribution along the body, BTU/FT^2 sec.
MDOT	Mass loss rate distribution along the body, LB/FT^2 sec.
QINT	Integrated heating distribution along the body, BTU/FT^2.
QINT(STAG)	Integrated stagnation point heating, BTU/FT^2.
QINT(SONIC)	Integrated sonic point heating, BTU/FT^2.

TABLE 6 (cont'd)

Rotational Quantities

PSI,THEALP,PHI	Euler angles, degrees.
ALPRIM	Angle of attack.
PR, Q, SMR, p, q, r	angular rates, rad/sec.
ALPENV	Envelope angle of attack, degrees.
CMQ	Stability derivative of pitching moment coefficient with q.
CM	Pitching moment coefficient.
CN	Yawing moment coefficient.
SMF	Frequency of oscillation, 1/sec.

Completion Codes

ITERM	-1,	Function is equal to zero.
	0,	Function is not equal to zero.
	1,	Function is undefined.
KRED	-1,	Number of applications of WRF has reached LRED limit
	0,	Optimization will continue with another search
	1,	Process will stop with either a non-zero function or an undefined function (see ITERM above)
LP	1-5	Normal completion in trajectory integration
	6	Abnormal situation in trajectory calculations.

Flow Chart Of Main Program And Optimization Logic

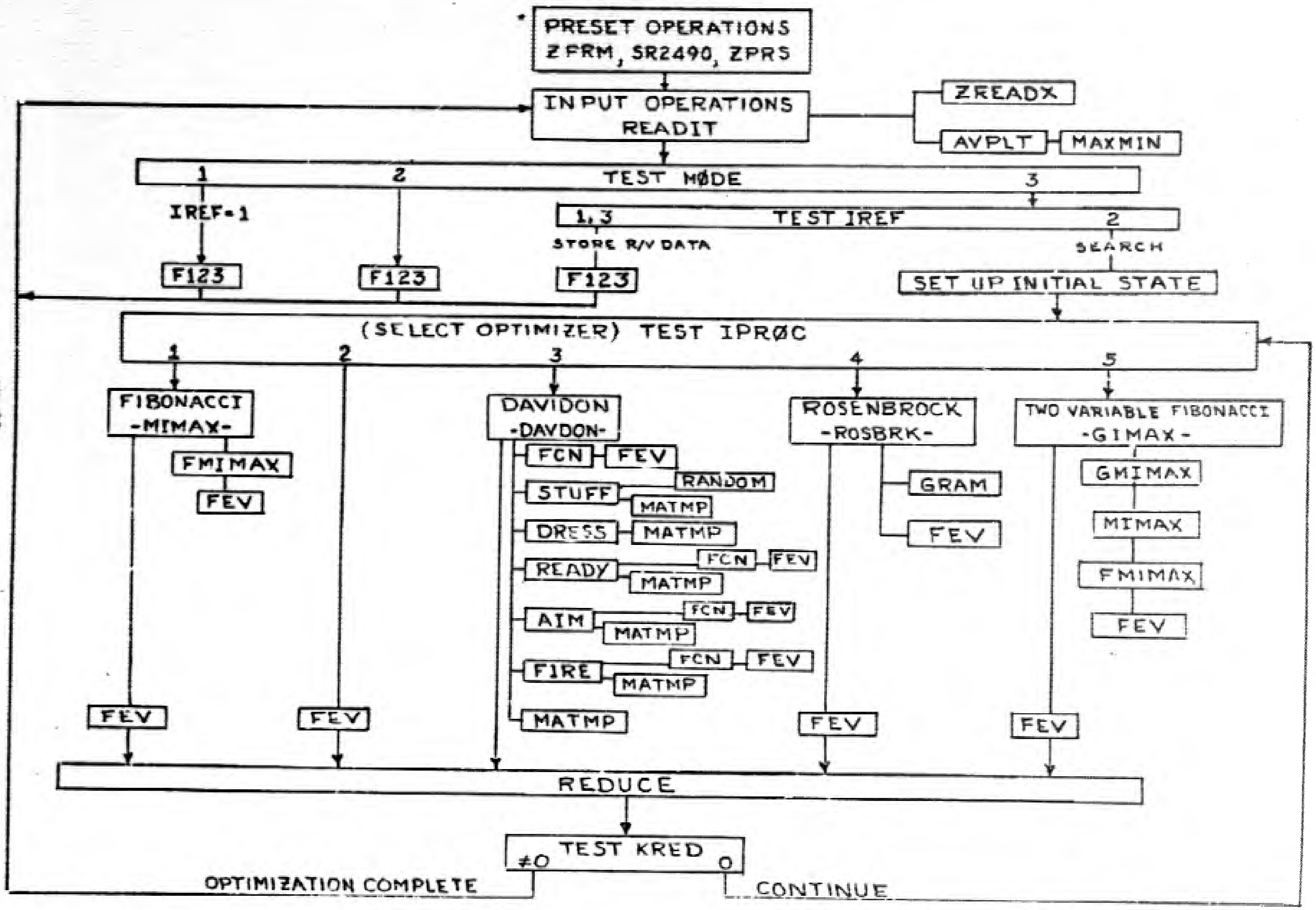


FIG 1

FLOW CHART OF FUNCTION EVALUATOR, FEV

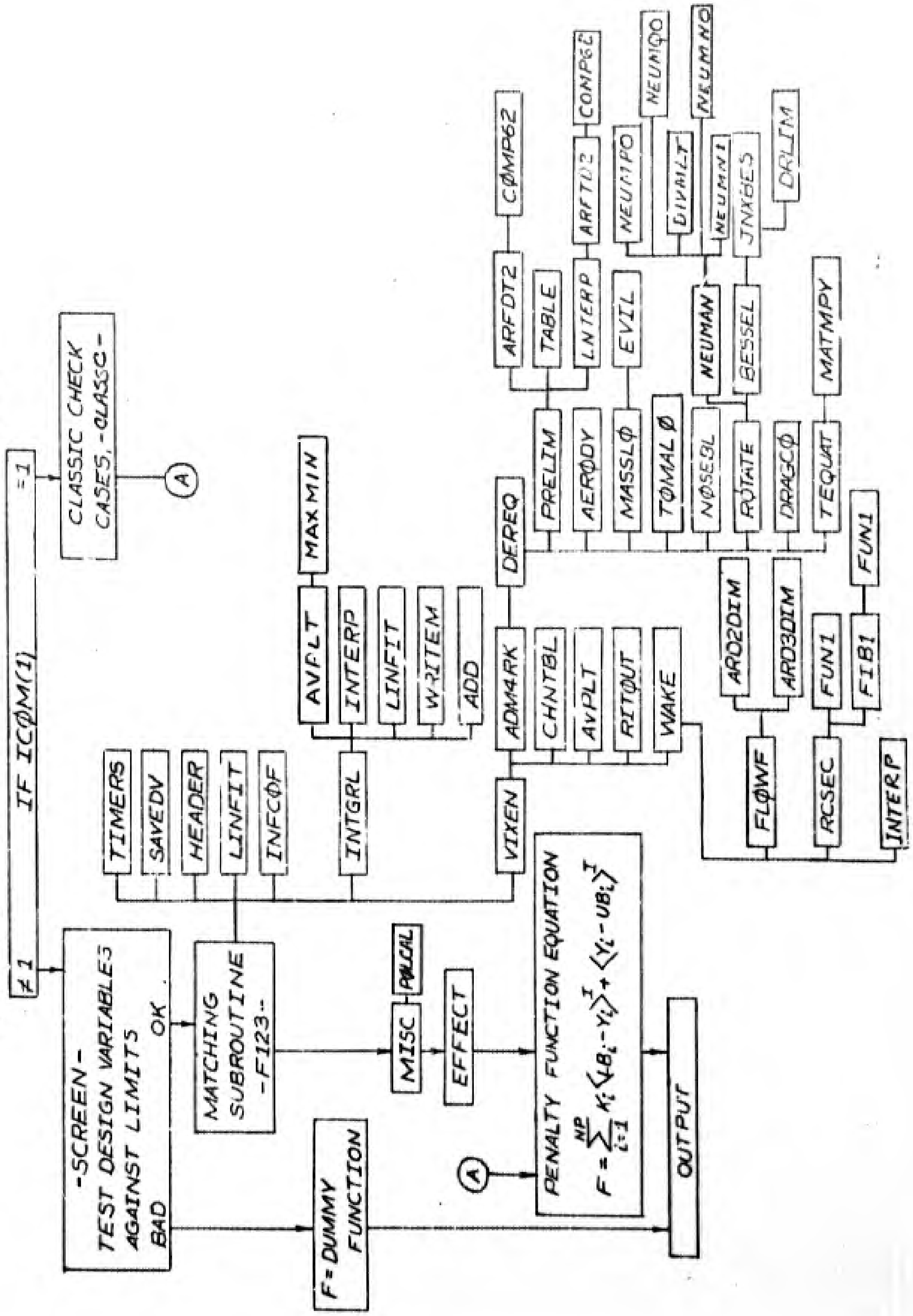


FIG 2

INPUT INTERRELATIONSHIPS

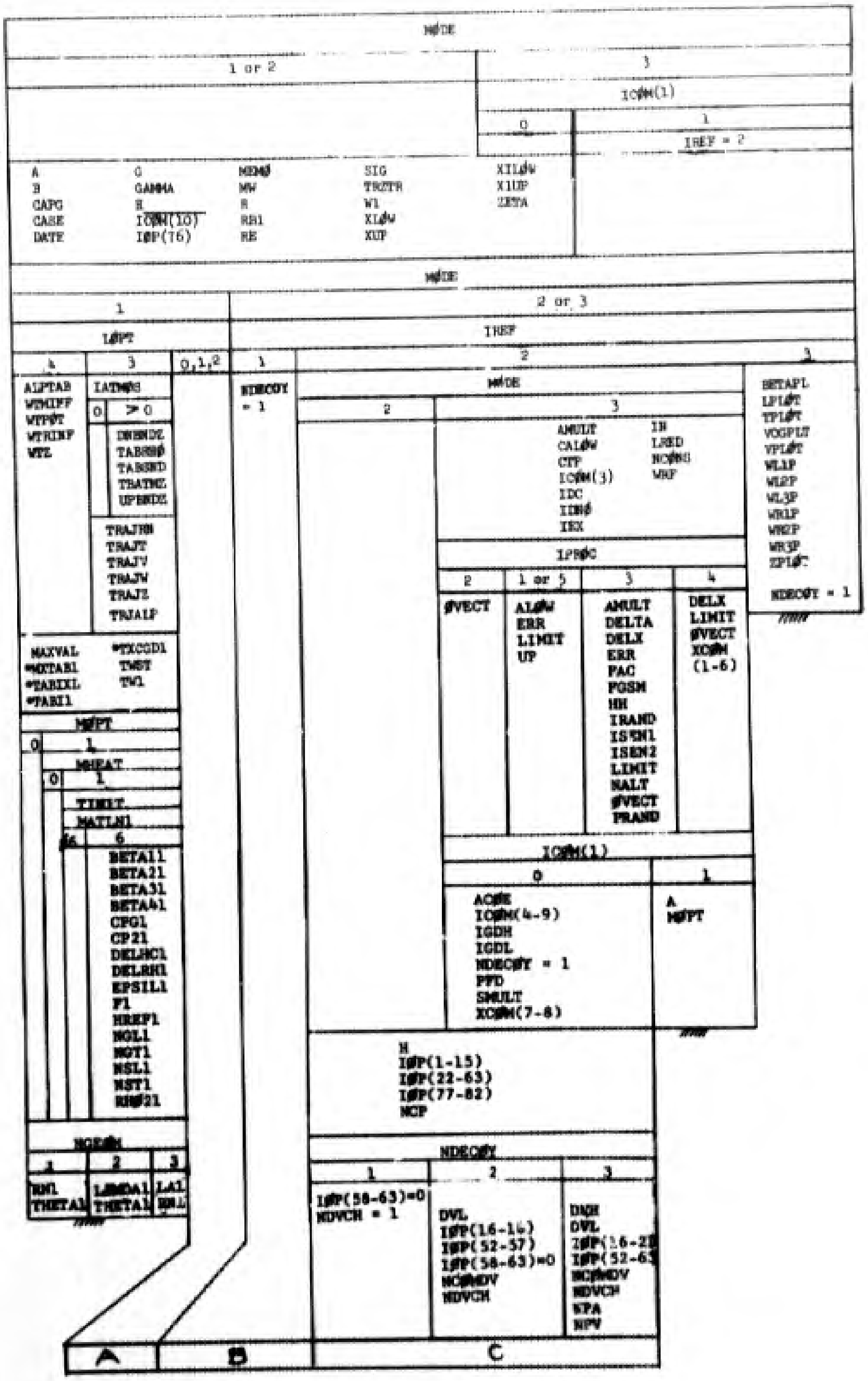


FIGURE 3-1

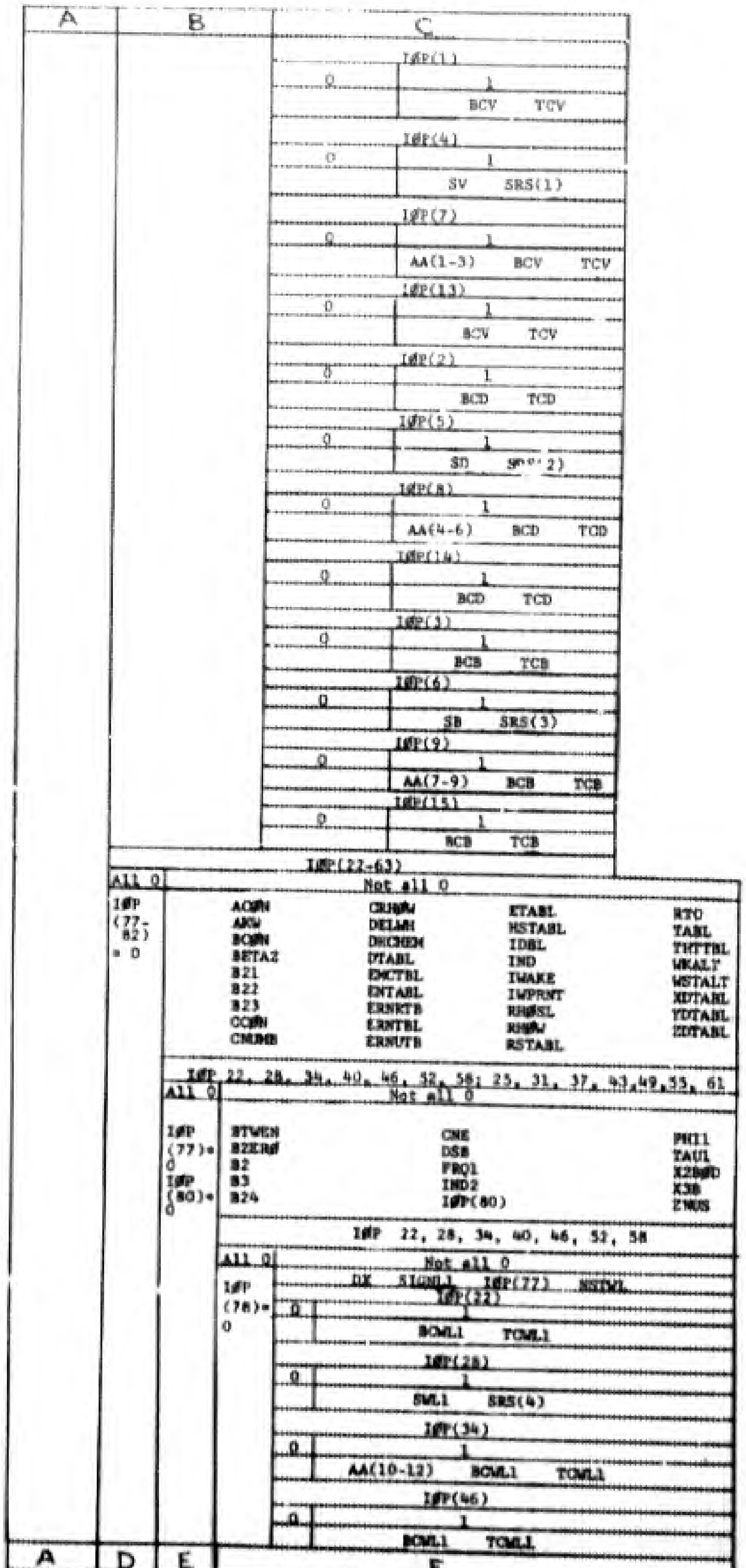

A
B
C
IØP(1)
0
1
BCV TCV
IØP(4)
0
1
SV SRS(1)
IØP(7)
0
1
AA(1-3) BCV TCV
IØP(13)
0
1
BCV TCV
IØP(2)
0
1
BCD TCD
IØP(5)
0
1
SD
IØP(8)
0
1
AA(4-6) BCD TCD
IØP(14)
0
1
BCD TCD
IØP(3)
0
1
BCB TCB
IØP(6)
0
1
SB SRS(3)
IØP(9)
0
1
AA(7-9) BCB TCB
IØP(15)
0
1
BCB TCB
IØP(22-63)
All 0
Not all 0
IØP (77-82) = 0
ACØN AKW BCØN BETA2 B21 B22 B23 CCØN CNUMB
CRHØW DELMH DHCHEM DTABL EMCTBL ENTABL ERNRTB ERNTBL ERNUTB
ETABL HSTABL IDBL IND IWAKE IWPRNT RHØSL RHØW RSTABL
RTO TABL THTTBL WKALT WSTALT XDTABL YDTABL ZDTABL
IØP 22, 28, 34, 40, 46, 52, 58; 25, 31, 37, 43, 49, 55, 61
All 0
Not all 0
IØP (77)= 0 IØP (80)= 0
BTWEN B2ERØ B2 B3 B24
CNE DSB FRQ1 IND2 IØP(80)
PHI1 TAU1 X2BØD X3B ZWUS
IØP 22, 28, 34, 40, 46, 52, 58
All 0
Not all 0
DX SIGNL1 IØP(77) NSTWL
IØP (78)= 0
IØP(22)
0
1
BCWL1 TCWL1
IØP(28)
0
1
SWL1 SRS(4)
IØP(34)
0
1
AA(10-12) BCWL1 TCWL1
IØP(46)
0
1
BCWL1 TCWL1
A
D
E
F

FIGURE 3-2

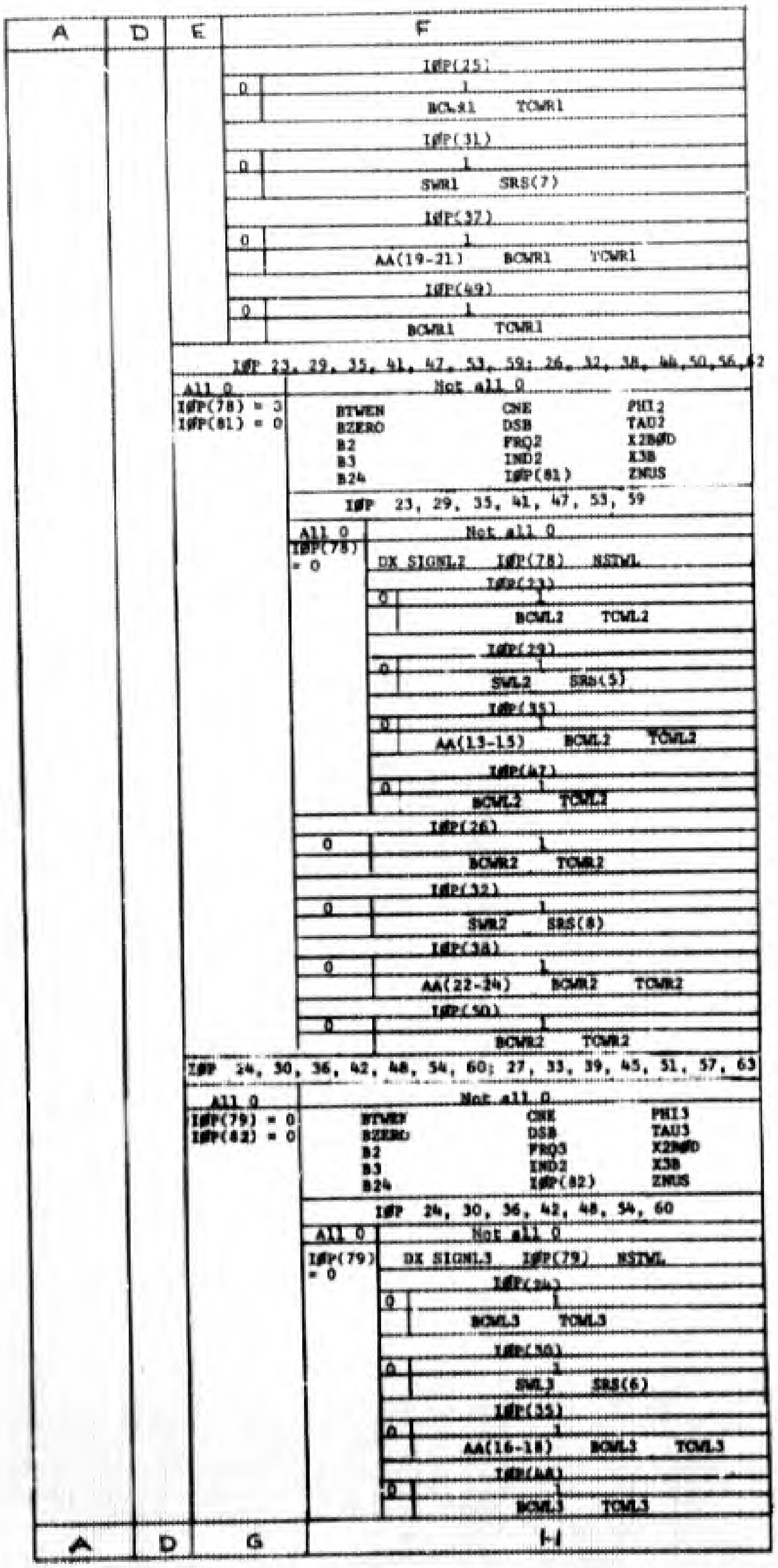

A D E F
IØP(25)
0 1
BCWR1 TCWR1
IØP(31)
0 1
SWR1 SRS(7)
IØP(37)
0 1
AA(19-21) BCWR1 TCWR1
IØP(49)
0 1
BCWR1 TCWR1
IØP 23, 29, 35, 41, 47, 53, 59; 26, 32, 38, 44, 50, 56, 62
All 0
IØP(78) = 0
IØP(81) = 0
Not all 0
BTWEN BZERO B2 B3 B24
CNE DSB FRQ2 IND2 IØP(81)
PHI2 TAU2 X2BØD X3B ZNUS
IØP 23, 29, 35, 41, 47, 53, 59
All 0
IØP(78) = 0
Not all 0
DX SIGNL2 IØP(78) NSTWL
IØP(23)
0 1
BCWL2 TCWL2
IØP(29)
0 1
SWL2 SRS(5)
IØP(35)
0 1
AA(13-15) BCWL2 TCWL2
IØP(47)
0 1
BCWL2 TCWL2
IØP(26)
0 1
BCWR2 TCWR2
IØP(32)
0 1
SWR2 SRS(8)
IØP(38)
0 1
AA(22-24) BCWR2 TCWR2
IØP(50)
0 1
BCWR2 TCWR2
IØP 24, 30, 36, 42, 48, 54, 60; 27, 33, 39, 45, 51, 57, 63
All 0
IØP(79) = 0
IØP(82) = 0
Not all 0
BTWEN BZERO B2 B3 B24
CNE DSB FRQ3 IND2 IØP(82)
PHI3 TAU3 X2BØD X3B ZNUS
IØP 24, 30, 36, 42, 48, 54, 60
All 0
IØP(79) = 0
Not all 0
DX SIGNL3 IØP(79) NSTWL
IØP(24)
0 1
BCWL3 TCWL3
IØP(30)
0 1
SWL3 SRS(6)
IØP(36)
0 1
AA(16-18) BCWL3 TCWL3
IØP(48)
0 1
BCWL3 TCWL3
A D G H

FIGURE 3-5

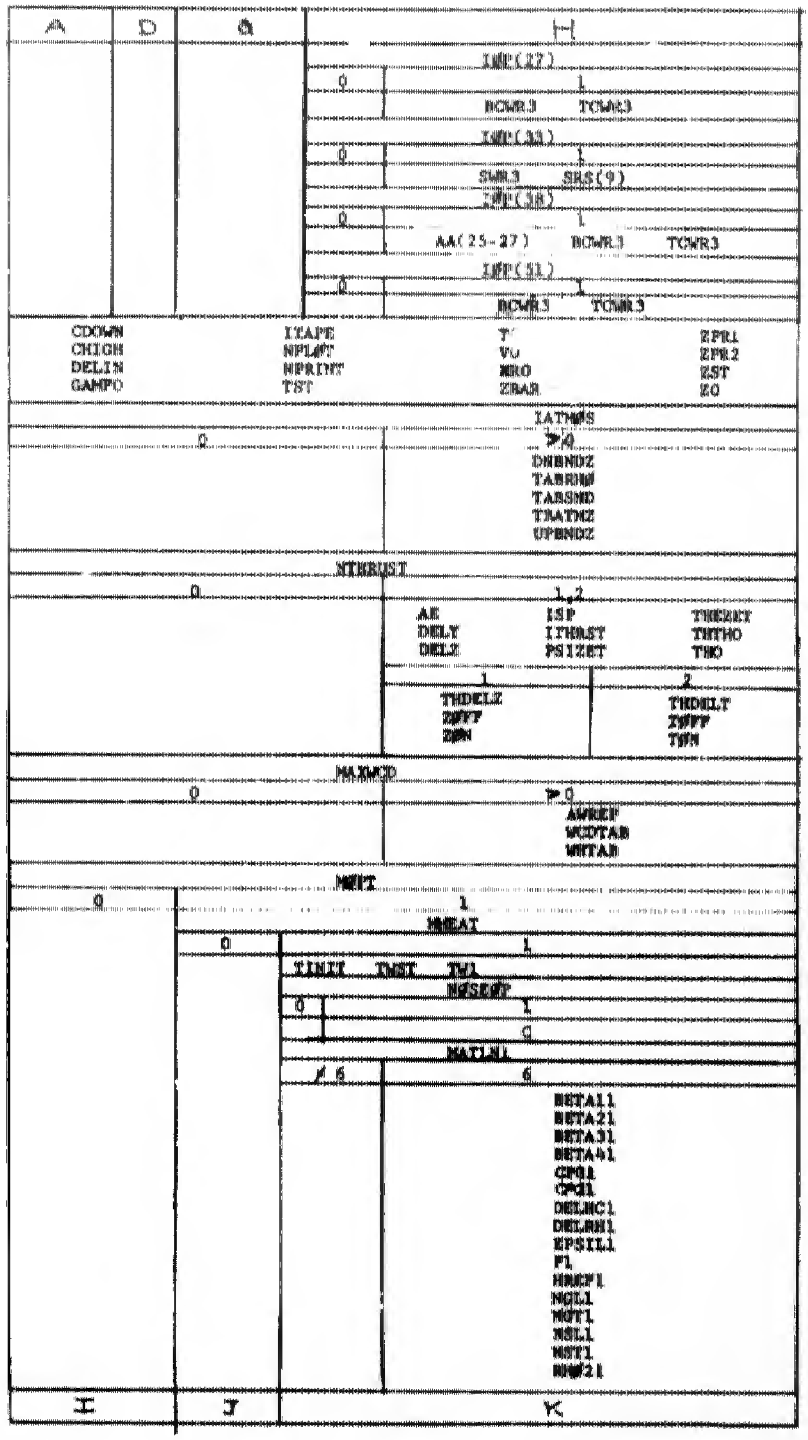
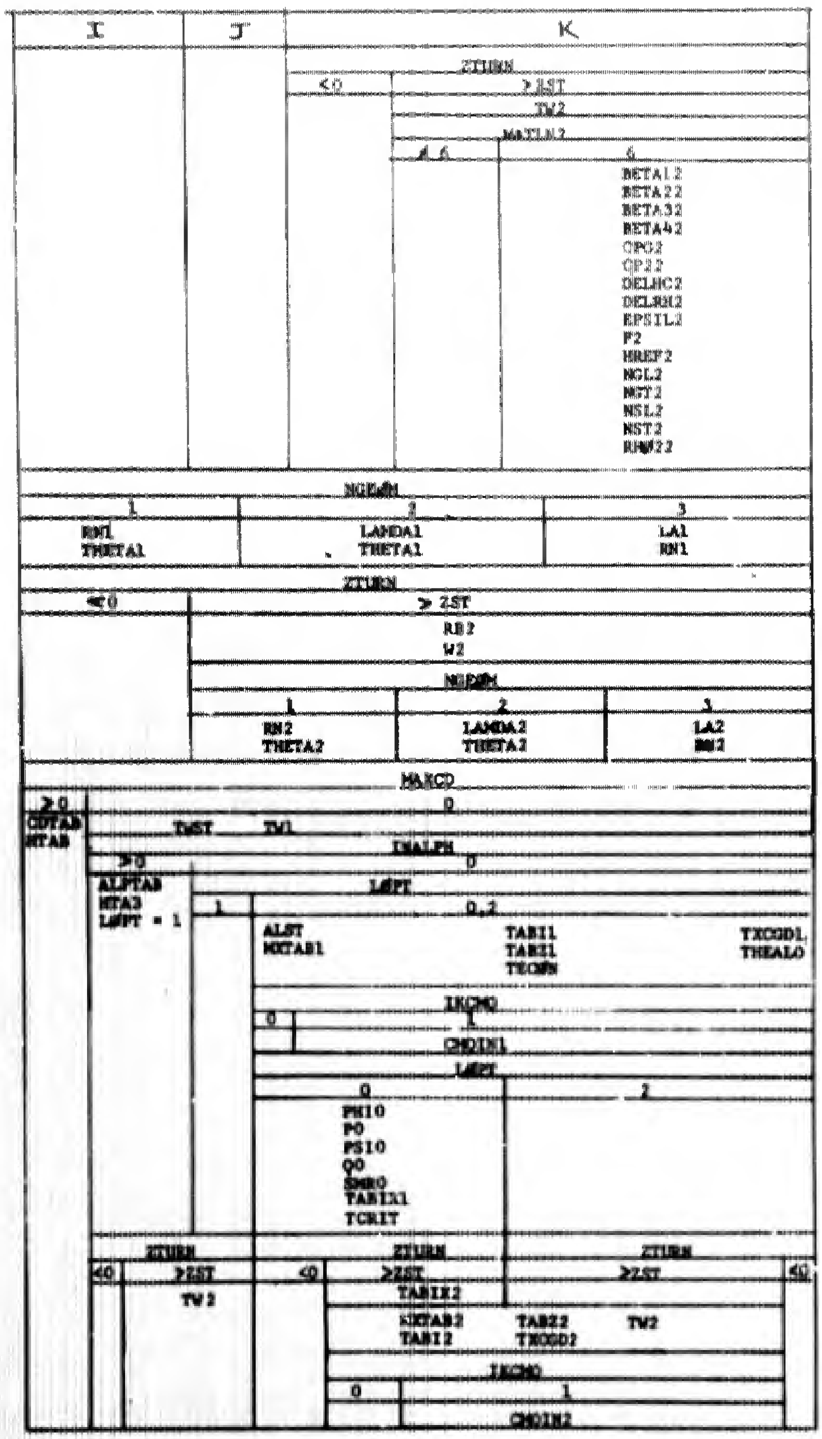

A
D
G
H
IØP(27)
0
1
BCWR3 TCWR3
IØP(33)
0
1
SWR3 SRS(9)
IØP(38)
0
1
AA(25-27) BCWR3 TCWR3
IØP(51)
0
1
BCWR3 TCWR3
CDOWN
CHIGH
DELIN
GAMPO
ITAPE
NPLØT
NPRINT
TST
T'
VO
XRO
ZBAR
ZPR1
ZPR2
ZST
ZO
IATMØS
0
>0
DNBNDZ
TABRHØ
TABSND
TRATMZ
UPBNDZ
NTHRUST
0
1,2
AE
DELY
DELZ
ISP
ITHRST
PSIZET
THEZET
THTHO
THO
1
THDELZ
ZØFF
ZØN
2
THDELT
ZØFF
TØN
MAXWCD
0
>0
AWREF
WCDTAB
WMTAB
MØPT
0
1
MHEAT
0
1
TINIT TWST TW1
NØSEØP
0
1
0
MATLN1
≠6
6
BETA11
BETA21
BETA31
BETA41
CP01
CP21
DELHC1
DELRH1
EPSIL1
F1
HREF1
NGL1
NGT1
NSL1
NST1
RHØ21
I
J
K

FIGURE 3-4



I
J
K
ZTURN
<0
>2ST
TW2
MATLN2
≠6
6
BETA12
BETA22
BETA32
BETA42
CPG2
CP22
DELHC2
DELRH2
EPSIL2
F2
HREF2
NGL2
NST2
NSL2
NST2
RHØ22
NGEØM
1
2
3
RN1
THETA1
LAMDA1
THETA1
LA1
RN1
ZTURN
<0
> 2ST
RB2
W2
NGEØM
1
2
3
RN2
THETA2
LAMDA2
THETA2
LA2
RN2
MAXCD
>0
CDTAB
NTAB
0
TWST
TW1
INALPH
>0
0
ALPTAB
NTA3
LØPT = 1
LØPT
1
0,2
ALST
NXTAB1
TAB11
TAB21
TECØN
TXCOD1
THEALO
IKCMD
0
1
CMDIN1
LØPT
0
2
PHI0
P0
PSI0
Q0
SMRO
TABIX1
TCRIT
ZTURN
<0
>2ST
TW2
ZTURN
<0
>2ST
TABIX2
NXTAB2
TAB12
TAB22
TXCOD2
TW2
IKCMD
0
1
CMDIN2
ZTURN
>2ST
<0

FIGURE 3-5

EULER ANGLE SYSTEM

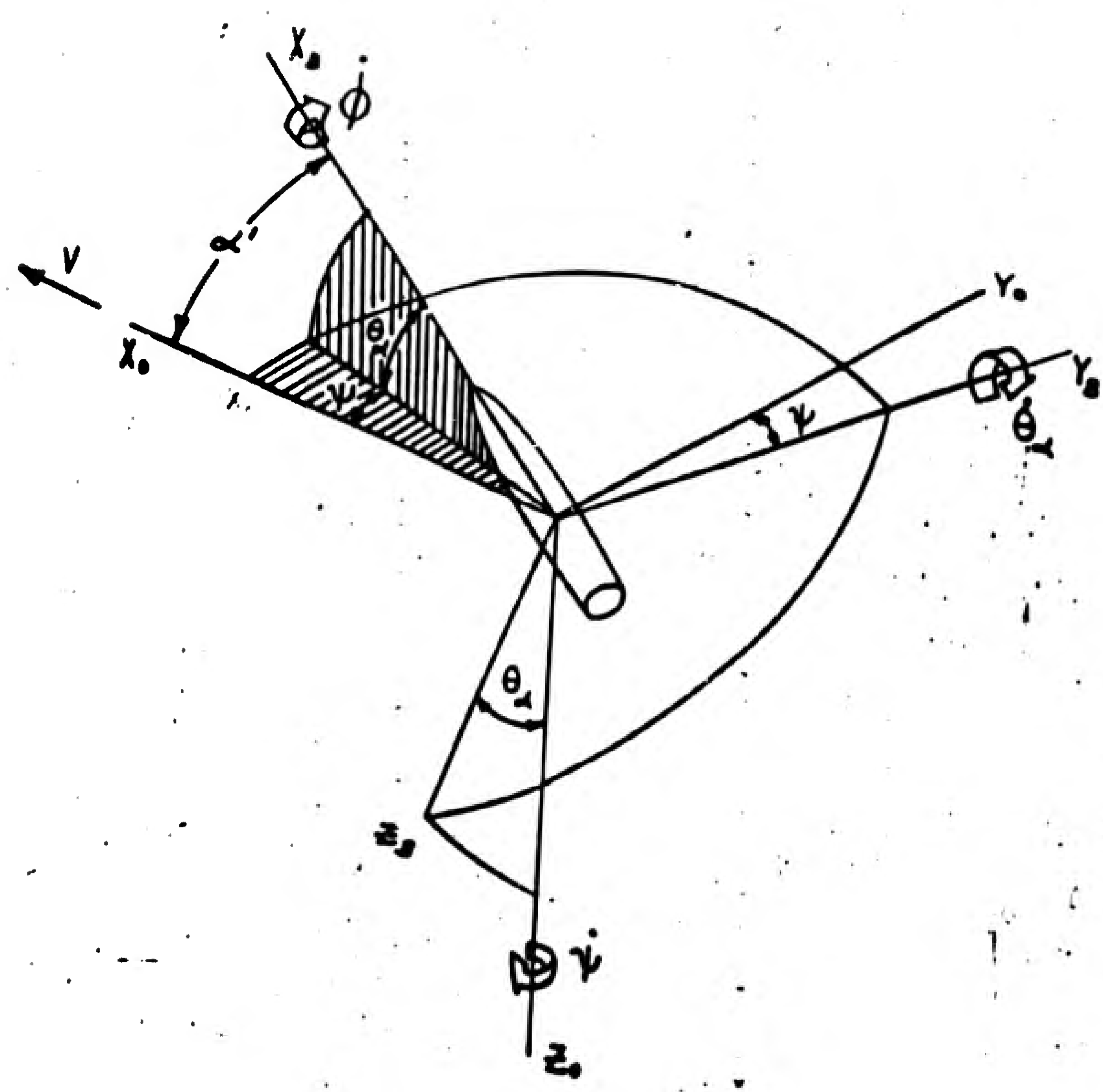


FIG 4

THRUST ORIENTATION

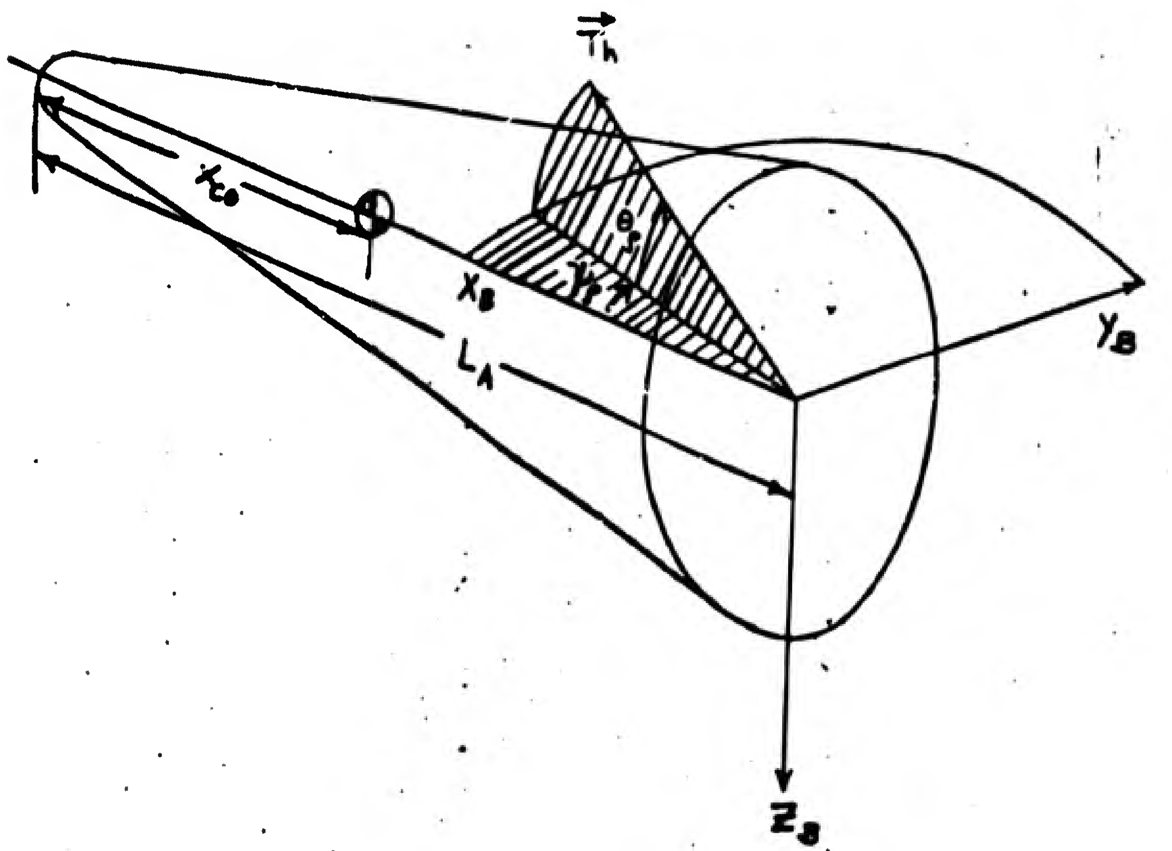


FIG 5

EXAMPLE USING ROSENBROCK'S TECHNIQUE

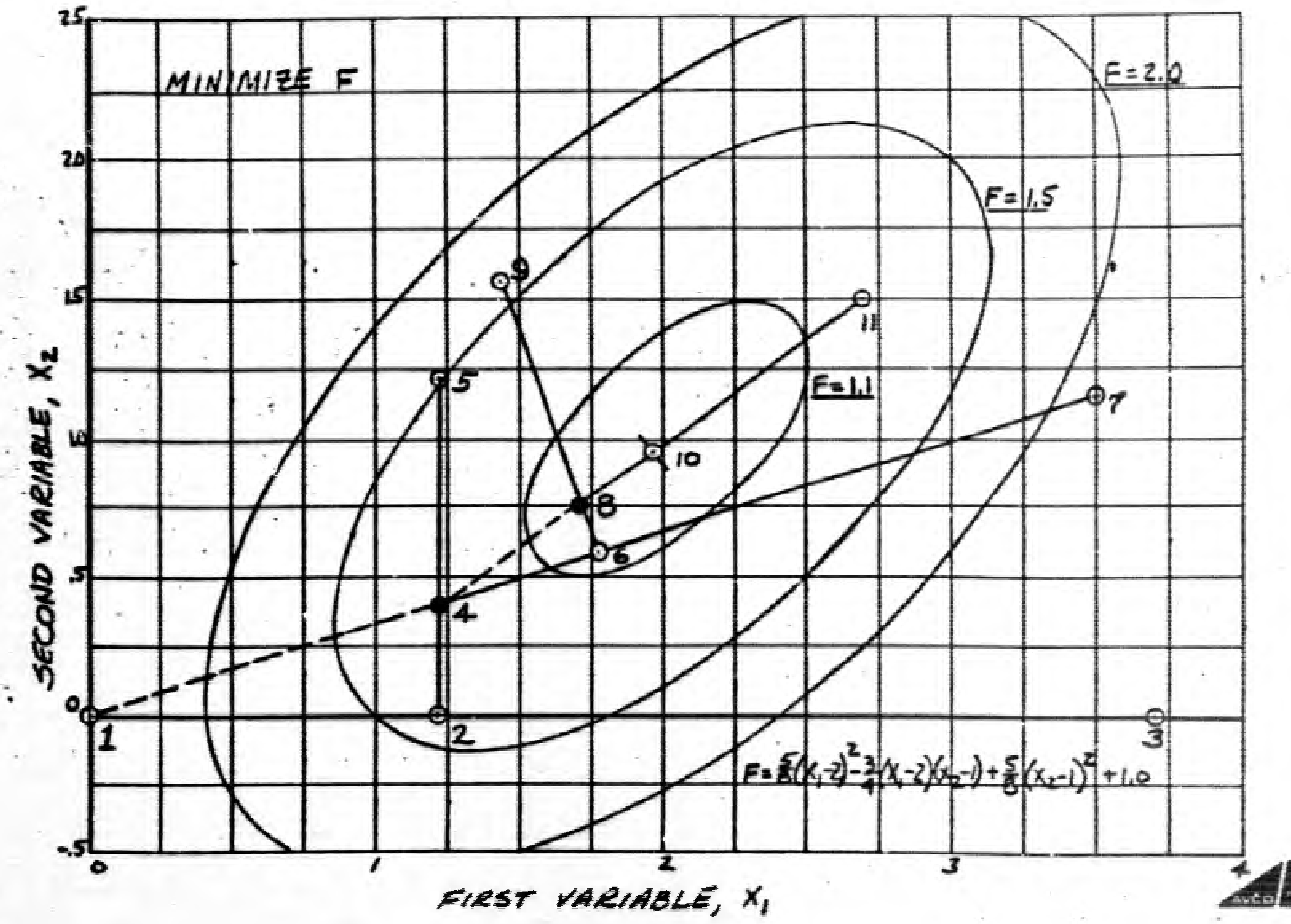
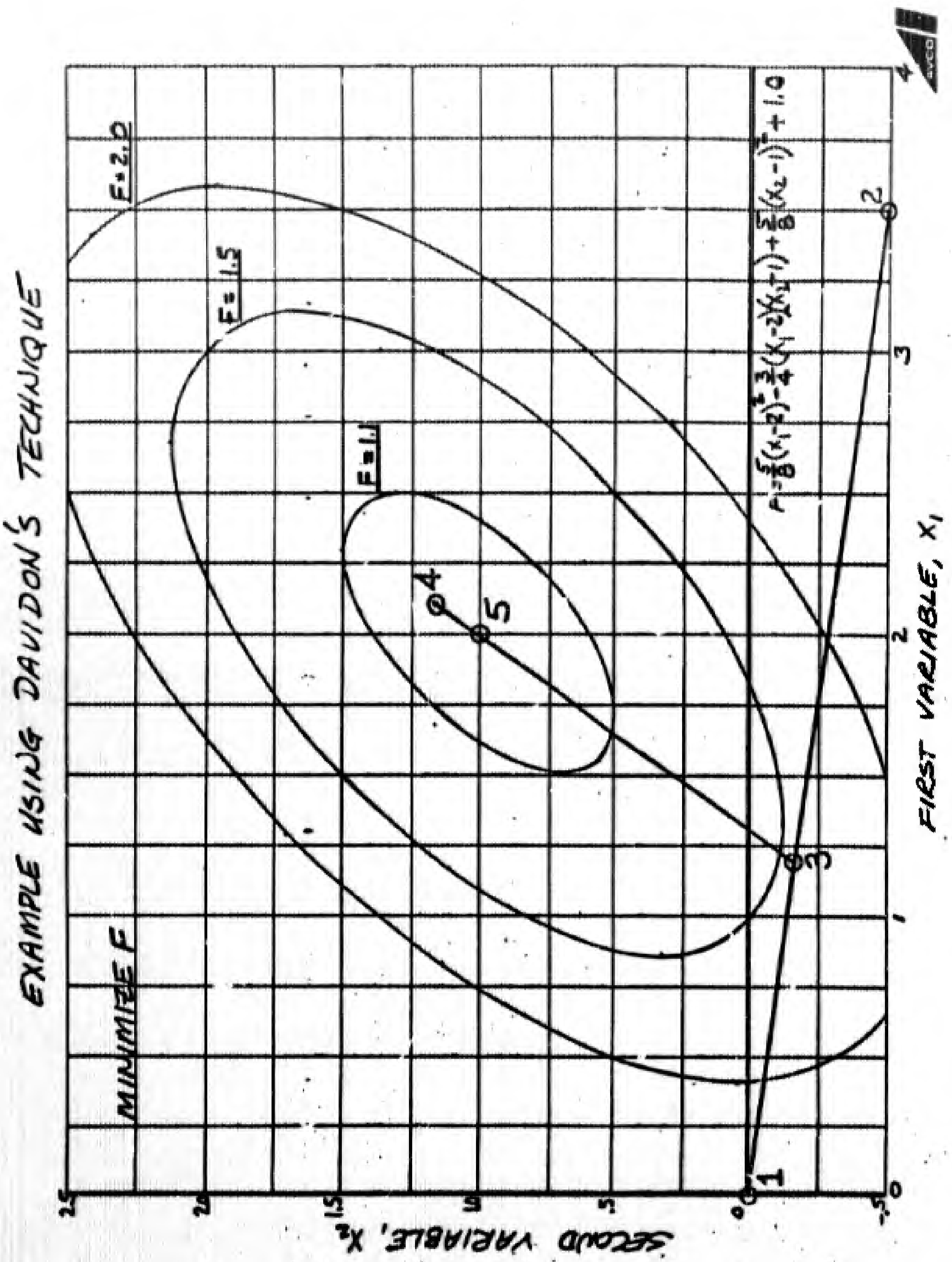
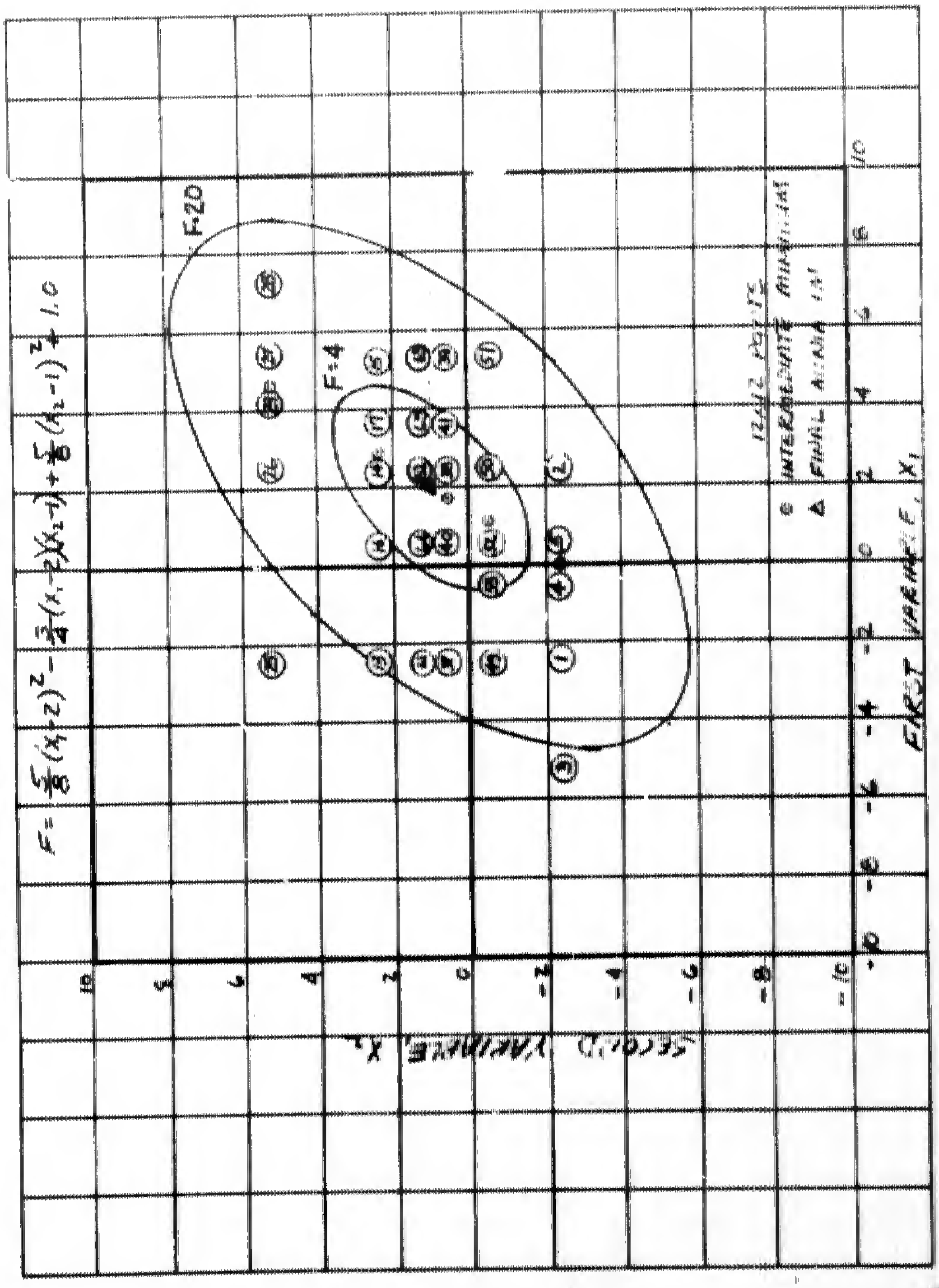


FIG 6



EXAMPLE USING DAVIDON'S TECHNIQUE
MINIMIZE F
F=2.0
F=1.5
F=1.1
F = 5/8 (X1-2)² - 3/4 (X1-2)(X2-1) + 5/8 (X2-1)² + 1.0
FIRST VARIABLE, X1
SECOND VARIABLE, X2

FIG 7



$F = \frac{5}{8}(x_1-2)^2 - \frac{3}{4}(x_1-2)(x_2-1) + \frac{5}{8}(x_2-1)^2 + 1.0$
F=20
F=4
FIRST VARIABLE, X_1
SECOND VARIABLE, X_2

FIG 6

EXAMPLE OF CONSTRAINED OPTIMIZATION

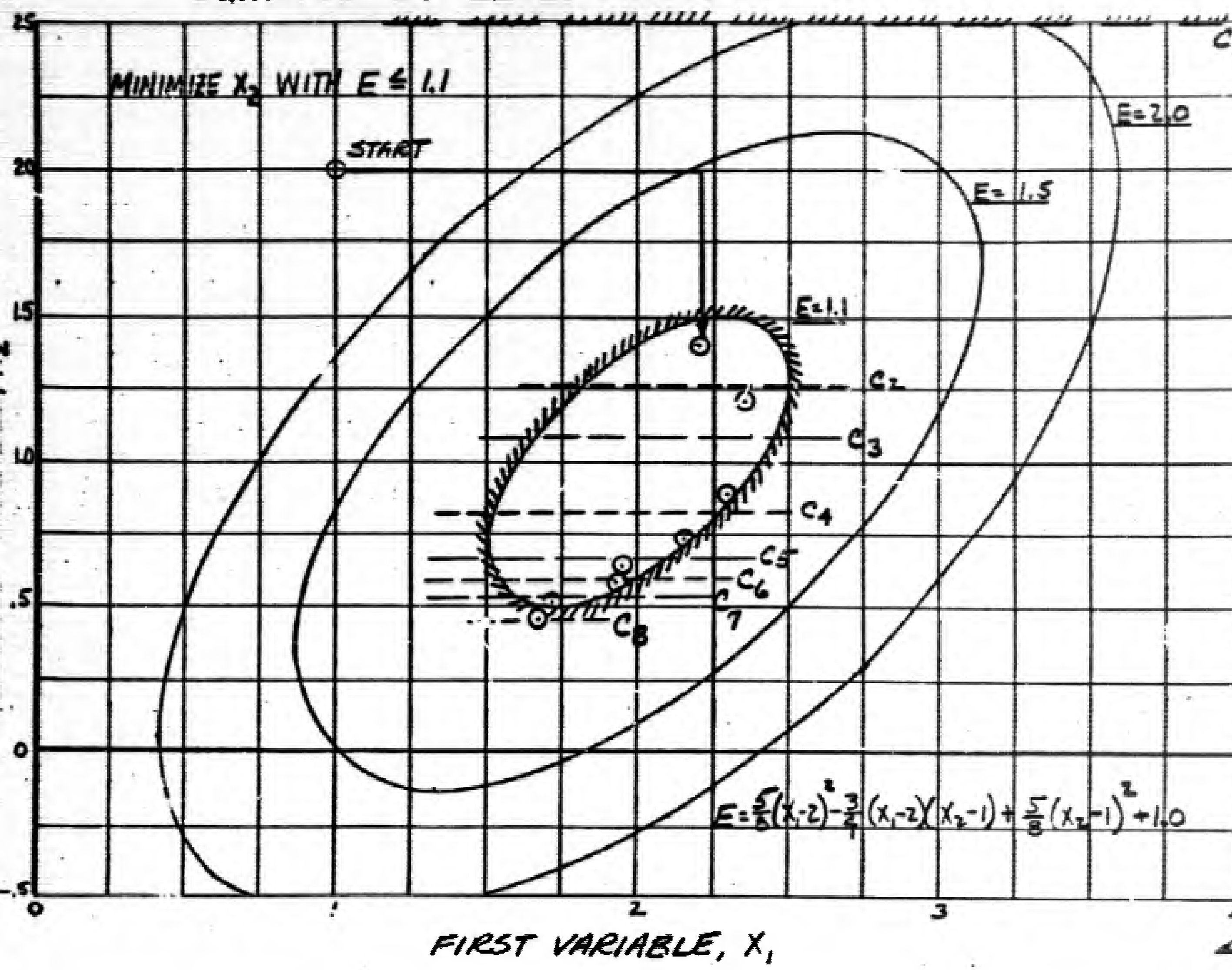


FIG 9

EXAMPLE USING ONE-VARIABLE FIBONACCI TECHNIQUE

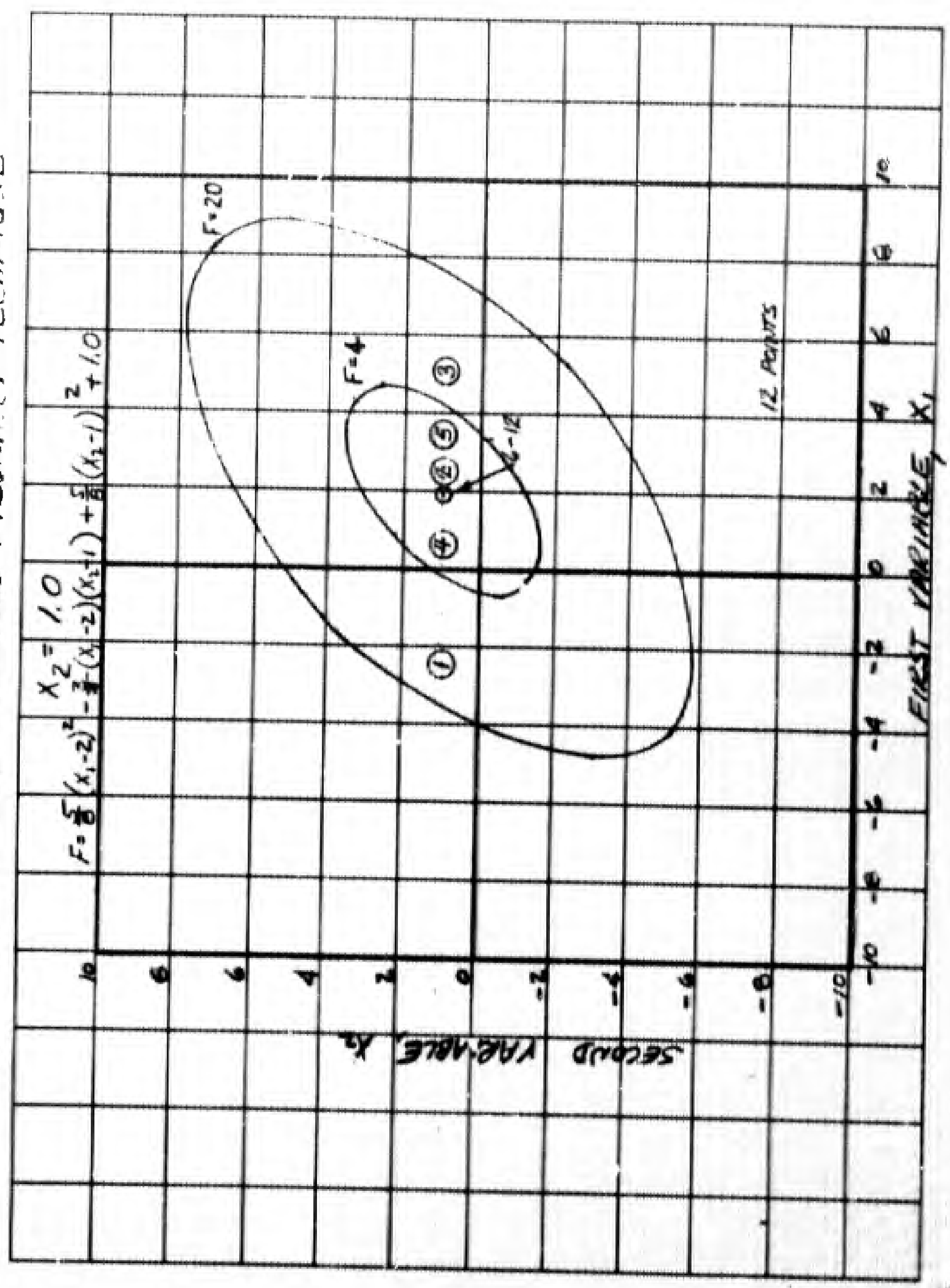


FIG 10

APPENDIX I

MASTER INPUT SHEETS

DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542	MEMO NO.	SECTION NO.	CONTINUATION SHEET PAGE OF PAGES

CASE ________ DATE ________ MEMØ ________

H ________

*MØDE ___ (3) *ICØM(1) ___ (0) *IREF ___ (1) *MØPT ___ (0)

A

*IPRØC ___ (1) XCØM(1) ___ (3.0) ERR ___ (0.01) *ICØM(3) ___ (0)

*LIMIT ___ (30) (2) ___ (0.5) FAC ___ (1.0) *LRED ___ (0)

*IEX ___ (2) (3) ___ (0.5) DELTA ___ (1.0) WRF ___ (0.9)

SMULT (1-25) ___ (10) (4) ___ (0.01)

(5) ___ (0.5)

(6) ___ (1.0E-4)

*IN ___ (1)

*IDNØ	DELX	ALØW	UP	ØVECT

*NCØNS ___ (1)

*IDC	AMULT	CALØW	CTP

2

DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542	MEMO NO.	SECTION NO.	CONTINUATION SHEET PAGE OF PAGES

FOSM ________ (4.0)   *NALT ________ (0)

PRAND ________ (0.0)   *ISEN1 ________ (0)

*IRAND ________ (0)   *ISEN2 ________ (0)

FAC ________ (1.0)   DELTA ________ (1.0)

If FAC is 0.0, the following table will be used for the initial matrix:

HH(1)	HH(41)	HH(81)	HH(121)	HH(161)	HH(201)	HH(241)	HH(281)

*ICØM (4) ________ (1)
(5) ________ (1)
(6) ________ (1)
(7) ________ (136)
(8) ________ (135)
(9) ________ (134)
XCØM (7) ________ (1.0)
(8) ________ (1.0)

ACØE

	*IGDH	*IGDL
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

3

DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542			CONTINUATION SHEET PAGE OF PAGES

*NCP ____
*IDBL ____(4)
PFD ____(0.0)

*IφP(1) ____(1)
(4) ____(1)
(7) ____(1)
(10) ____(1)
(13) ____(1)
(16) ____(1)
(19) ____(1)

AA(1) ____(0.)
(2) ____(0.)
(3) ____(1.)
SRS(1) ____(40.)

*IφP(2) ____(1)
(5) ____(1)
(8) ____(1)
(11) ____(1)
(14) ____(1)
(17) ____(1)
(20) ____(1)

AA(4) ____(0.)
(5) ____(0.)
(6) ____(1.)
SRS(2) ____(40.)

*IφP(3) ____(1)
(6) ____(1)
(9) ____(1)
(12) ____(1)
(15) ____(1)
(18) ____(1)
(21) ____(1)

AA(7) ____(0.)
(8) ____(0.)
(9) ____(1.)
SRS(3) ____(40.)

*IφP(22) ____(0)
(28) ____(0)
(34) ____(0)
(40) ____(0)
(46) ____(0)
(52) ____(0)
(58) ____(0)
(77) ____(0)

AA(10) ____(0.)
(11) ____(0.)
(12) ____(1.)
SRS(4) ____(40.)

	H	BCY	TCY	SY	BCD	TCD	SD	BCB	TCB	SB	BCWL1	TCWL1	SWL1
1													
2													
3													
4													
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27													
28													

4

DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542	[illegible] NO.	SECTION NO.	CONTINUATION SHEET PAGE OF PAGES

*IΦP(23) ____ (0)	*IΦP(24) ____ (0)	*IΦP(25) ____ (0)	*IΦP(26) ____ (0)	*IΦP(27) ____ (0)
(29) ____ (0)	(30) ____ (0)	(31) ____ (0)	(32) ____ (0)	(33) ____ (0)
(35) ____ (0)	(36) ____ (0)	(37) ____ (0)	(38) ____ (0)	(39) ____ (0)
(41) ____ (0)	(42) ____ (0)	(43) ____ (0)	(44) ____ (0)	(45) ____ (0)
(47) ____ (0)	(48) ____ (0)	(49) ____ (0)	(50) ____ (0)	(51) ____ (0)
(53) ____ (0)	(54) ____ (0)	(55) ____ (0)	(56) ____ (0)	(57) ____ (0)
(59) ____ (0)	(60) ____ (0)	(61) ____ (0)	(62) ____ (0)	(63) ____ (0)
(78) ____ (0)	(79) ____ (0)	(80) ____ (0)	(81) ____ (0)	(82) ____ (0)
AA (13) ____ (0.)	AA (16) ____ (0.)	AA (19) ____ (0.)	AA (22) ____ (0.)	AA (25) ____ (0.)
(14) ____ (0.)	(17) ____ (0.)	(20) ____ (0.)	(23) ____ (0.)	(26) ____ (0.)
(15) ____ (1.)	(18) ____ (1.)	(21) ____ (1.)	(24) ____ (1.)	(27) ____ (1.)
SRS (5) ____ (40)	SRS (6) ____ (40)	SRS (7) ____ (40)	SRS (8) ____ (40)	SRS (9) ____ (40)

BCWL2	TCWL2	SWL2	BCWL3	TCWL3	SWL3	BCWR1	TCWR1	SWR1	BCWR2	TCWR2	SWR2	BCWR3	TCWR3	SWR3

5

DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542	MEMO NO.	SECTION NO.	CONTINUATION SHEET PAGE OF PAGES

ACØN ______ (1.0)
AKW ______ (50. BTU/FT-°R-HR)
BCØN ______ (1.0)
B21 ______ (1.0)
B22 ______ (0.25)
B23 ______ (0.0)
CCØN ______ (1.0)
CRHØW ______ (0.75 BTU/lb-°R)
DELWH ______ (0.01 in.)
DHCHEM ______ (0.0 FT²/sec²)
*IND ______ (0)
RHØSL ______ (0.08042 lb/ft³)
RHØW ______ (115. lb/ft³)
RTO ______ (9.475E5 ft²/sec²)
TABL ______ (1500. °K)

CNUMB(59) ______ (0.66)
(60) ______ (1.2)
(83) ______ (4.4E26)
(84) ______ (0.0)
(91) ______ (6.3246E14)
(115) ______ (1.0E11)
(135) ______ (1.0E-10)
(159) ______ (0.66)
(160) ______ (120.0)

CNUMB(64) ______ (0.0)
(65) ______ (0.0)
(66) ______ (0.25)
(67) ______ (0.5)
(85) ______ (1.0)
(86) ______ (0.0)
(87) ______ (1.0)
(88) ______ (0.0)
(89) ______ (1.0)
(90) ______ (1.0)
(92) ______ (0.0)
(93) ______ (1.0)
(100) ______ (0.0)
(116) ______ (1000.)
(117) ______ (1.0)
(118) ______ (1.0)
(119) ______ (1000.)
(120) ______ (0.0)
(121) ______ (0.0)
(122) ______ (1.0)
(123) ______ (5.E-12)
(124) ______ (-1.5)
(125) ______ (1.0)
(130) ______ (1.0)
(131) ______ (0.0)

CNUMB(132) ______ (1.0)
(133) ______ (0.0)
(134) ______ (2.0)
(136) ______ (0.0)
(164) ______ (0.04)
(165) ______ (86.0)
(169) ______ (1.0)
BZERØ ______ (5.8E-21)
B2 ______ (4.0E-10)
B3 ______ (2.0)
BTWEN ______ (1.0)
B24 ______ (1.0E-26)
CNUMB(1) ______ (0.02)
(2) ______ (2.0)
(3) ______ (1.0)
(4) ______ (0.0)
(5) ______ (0.5)
DX ______ (50.0)
*IND2 ______ (0)
*NSTWL ______ (100)
ZNUS ______ (2.0E11)

CNE ______ (0.0)
DSB ______ (0.0)
X2BØD ______ (0.0)
X3B ______ (0.0)

*IDBL ______ (4) *IØP( ) ______ ( ) ______ ( ) ______ ( ) ______

*IWAKE ______ (2) WSTALT ______ (180000.) *IWPRNT ______ (0)

	WKALT	BETAZ	PHI1	PHI2	PHI3
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

FRQ1 ______ (4.35E8 cps)
SIGNL1 ______ (1.0E-6 m²)
TAU1 ______ (1.0 μ sec)

FRQ2 ______ (1.375E9 cps)
SIGNL2 ______ (1.0E-6 m²)
TAU2 ______ (1.0 μ sec)

FRQ3 ______ (5.4E9 cps)
SIGNL3 ______ (1.0E-6 m²)
TAU3 ______ (0.4 μ sec)

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DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542	PROGRAMMER
	TITLE:	

DEPT NO.	SECTION NO.	COST ORDER NO.	(EDPD USE ONLY)	REQUESTED BY	EXT.	EST. TIME	PAGE OF

HEADING CARD

NAME_______________ CASE_______________ DATE_______________

H____

*MØDE_____ (3) *IREF_____ (1) *NDECØY_____ (1) *NDYCH_____ (1)

PRINT CØNTRØLS

ZPR1_______________ (10000.0 ft.) Initial altitude increment.

ZBAR_______________ (-1.0 E 4 ft.) Altitude for increment change.

ZPR2_______________ (ft.) Second altitude increment.

PRØGRAM STØPS

TST_______________ (100.0 sec.) ZST_______________ (0.0 ft.) ALST_______________ (0.2°)

TRAJECTØRY INPUTS

LØPT*_______________ (1)
= 0 Rotational Trajectory
= 1 Particle Trajectory
= 2 Simplified Angle of Attack Trajectory

ZO_______________ (ft.) GAMFO_______________ (deg.) VO_______________ (ft/sec)

XRO_______________ (0.0 ft.) TO_______________ (sec.)

TRZTR_______________ (ft.) If > 0.0 overrides calculated transition altitude

If LØPT* = 2

THEALO_______________ (deg.) TECØN_______________ (2.0 sec.)

If LØPT* = 0

PO_______________ (rad/sec) QO_______________ (rad/sec) SMRO_______________ (rad/sec)

PSIO_______________ (deg.) THEALO_______________ (deg.) PHIO_______________ (deg.)

TCRIT 1.0 D-5 (sec.) TECØN 1.0 D-5 (sec.)

*NOTE***
1. Pre-set values and required units for dimensional quantities are indicated in parentheses.
2. Starred quantities are input with no decimal point; all other inputs require decimal points.

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DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542	MEMO NO.	SECTION NO.	CONTINUATION SHEET PAGE OF PAGES

CØNFIGURATIØN

NGEØM __________ (1)

= 1 Input W, RN, RB, and THETA.
= 2 Input W, RB, THETA, and LAMDA.
= 3 Input W, RN, RB, and LA.

IKCMQ __________ If > 0 input c_{m_q} CMQIN1 __________ First config. input CMQ

W1 __________ (lb.) RN1 __________ (in.) RB1 __________ (in.)

THETA1 __________ (deg.) LAMDA1 __________ LA1 __________ (in.)

For NXTAB1 = 1 omit TABZ1; for NXTAB2 = 1 omit TABZ2.

NXTAB1* __________ (1) Number of table entries - maximum of 50.

TABZ1 (ft.)	TXCGD1	TABI1 (1.slug - ft^2)	TABIX1 (1.slug - ft^2)

If the option for discontinuous change in geometry is exercised, ZTURN > 0, all quantities corresponding to the selected NGEØM, IKCMQ must be input.

ZTURN __________ (-1.0 ft.) Altitude at which configuration changes.

W2 __________ (lb.) RN2 __________ (in.) RB2 __________ (in.)

THETA2 __________ (deg.) LAMDA2 __________ LA2 __________ (in.)

NXTAB2* __________ (1) CMQIN2 __________

TABZ2 (ft.)	TXCGD2	TABI2 (1.slug - ft^2)	TABIX2 (1.slug - ft^2)

MASS LØSS

NØPT* __________ NHEAT* __________ (0) NØSEØP* __________

MATIN1* __________ (1) TW1 __________ (1200.°R)

If ZTURN > 0, input MATIN2 and TW2.

MATIN2* __________ (1) TW2 __________ (1200.°R)

The material number values for built-in properties are as follows: TEFLON is 1, [illegible] is 2, OTWR is 3, Phenolic Nylon is 4, Carbon Phenolic is 5, input material properties is 6.

TWST __________ (380°R) TINIT __________ (500.0°R)

C __________ (1.0) Multiplier on stag. point heating; simulates nose tip of a different material by changing the nose recession and mass loss characteristics; the correct qstag is printed in output.

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DIGITAL COMPUTER INPUT REQUEST FORM	PROJECT NO. 2542	MEMO NO.	SECTION NO.	CONTINUATION SHEET PAGE OF PAGES

PLOTTING

NPLØT* ____ (1) ____ (2) ____ (3) ____ (4) ____ (5)

NPLØT(1)= 1 $C_{d_{total}}$ vs. Z, $C_{d_p}+C_{d_b}$ vs. M_∞, $C_{d_{f\infty}}$ vs. Z, C_{d_I} vs. Z

NPLØT(2)= 1 Beta vs. Z; V, M_∞, $\dot{V}/g$, Z, q_D vs. t

NPLØT(3)= 1 W_{total}/W_I vs. Z; P_s, H_s/RT_o vs. t

For $\lambda = 0$ $\dot{q}_{stag}$ and $\dot{q}_8$ vs. t

For $\lambda \neq 0$ $\dot{q}_{stag}$, $\dot{q}_{sonic}$, $\dot{q}_7$, $\dot{q}_8$ vs. t

NPLØT(4)= 1 α_{ENV} vs. t

NPLØT(5)= 1 Where I is the number specifying the variable OCCUR(I) to be plotted vs. time

* Enter zero to omit a set of plots

TAPE OPTION

ITAPE*________ (0) = 0 No tape
= 1 500 values each of the quantities V, β, and Z are stored on tape

PRINT OPTION

NPRINT*________ (1) = 0 No printed output FROM VIXEN, but plots and tape may still be generated.
= 1 Printed output FROM VIXEN.

PHYSICAL CONSTANTS

CAPG________ (32.21852 ft/sec^2) G________ (32.174 ft/sec^2) GAMMA________ (1.4)

MW________ (28.9 $\frac{grams}{mole}$) SIG________ (3.5 angstroms) R________ (53.5 $\frac{ft\text{-}lb}{lbm\text{-}^\circ R}$)

RE________ (2.090229 E+7 ft) ZETA________ (0.9)

4

DIGITAL COMPUTER INPUT REQUEST FORM	PROGRAM NO. 2542	USER NO.	SECTION NO.	CONTINUATION SHEET PAGE OF PAGES

CASE ________ DATE ________ MEMO ________

H ____

*MØDE ______ (3) *IREF ______ (1) *LPLØT ______ (1)

	ZPLØT	VPLØT	BETAPL	W06PLT	TPLØT	WL1P	WL2P	WL3P	WR1P	WR2P	WR3P
1											
2											
3											
4											
5											
6											
7											
8											
9											
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33											
34											

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DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542	MEMO NO.	SECTION NO.	CONTINUATION SHEET PAGE OF PAGES

CASE ________ NDECØY* ________ NDVCH* ________

H ____________________

NCØMDV*	DVL	DVH

*IØP (16) ____ ____ ____ ____ ____ ____

*IØP(52) ____ ____ ____ ____ ____ ____

*IØP (58) ____ ____ ____ ____ ____ ____

NPA* ________

NPV* ____ ____ ____ ____ ____ ____ ____ ____ ____ ____

____ ____ ____ ____ ____ ____ ____ ____ ____ ____

____ ____ ____ ____ ____ ____ ____ ____ ____ ____

____ ____ ____ ____ ____ ____ ____ ____ ____ ____

DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO.	MEMO NO.	SECTION NO.	CONTINUATION SHEET
	2542			PAGE OF PAGES

INPUT DRAG COEFFICIENTS

MAXCD* ____________ (0) IF MAXCD > 0 INPUT HTAB (FT), CDTAB (MAX. 75)

MAXWCD* ____________ (0) IF MAXWCD > 0 INPUT WHTAB (FT), WCDTAB TO BE ADDED TO CALCULATED C_D OR TO CDTAB (MAX. 75)

AWREF ____________ FT^2 REFERENCE AREA FOR WCDTAB

HTAB (FT)	CDTAB

WHTAB (FT)	WCDTAB

12.

DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542	SERIES NO.	SECTION NO.	CONTINUATION SHEET PAGE OF PAGES

THRUST

NTHRUST* __________ (0) = 0 No Thrust
= 1 ZØN, THTHO vs. THDELZ
= 2 TØN, THTHO vs. THDELT

ZØN __________ (FT) OR TØN __________ (SEC)

ZØFF __________ (FT) TØFF __________ (SEC)

ISP __________ (1.0 SEC) AE __________ (FT^2) THO __________ (LB)

PSIZET __________ (DEG) THEZET __________ (DEG)

DELY __________ (IN) DELZ __________ (IN)

KTHRST* __________ (NO. OF TABLE ENTRIES-MAX 25)

Indicate the Appropriate Parameter:

THDELZ OR THDELT	THTHO

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DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542	W. A. NO.	SECTION NO.	CONTINUATION SHEET PAGE of

INPUT ANGLE OF ATTACK

For use with LØPT = 1 trajectory option; if INALPH > 0 with LØPT = 0 or 2 input ALPHA option overrides and rotational calculations are not performed.

INALPH=__________ (0) Number of values in the input angle of attack table; value greater than zero triggers use of input table; maximum of 75 values allowed.

HTAB (ft.)	ALPTAB (degrees)

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DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542	MEMO NO.	SECTION NO.	CONTINUATION NOTE PAGE OF PAGE

INPUT MATERIAL PROPERTIES

If the material number designation = 6, input the list of material properties corresponding to the configuration. Both sets of input properties may be used at the same time.

If MATLN1 = 6 input:		If MATLN2 = 6, input:
BETA11 ________	(ft/sec /°R)	BETA12 ________
BETA21 ________	(°R/ft/sec)	BETA22 ________
BETA31 ________	(dimensionless)	BETA32 ________
BETA41 ________	(°R)	BETA42 ________
CP21 ________	(Btu/lbm/°R)	CP22 ________
CPG1 ________	(Btu/lbm/°R)	CPG2 ________
DELHC1 ________	(Btu/lbm)	DELHC2 ________
DELRH1 ________	(lbm/ft^3)	DELRH2 ________
EPSIL1 ________	(dimensionless)	EPSIL2 ________
F1 ________	(dimensionless)	F2 ________
HREF1 ________	(dimensionless)	HREF2 ________
NGL1 ________	(dimensionless)	NGL2 ________
NGT1 ________	(dimensionless)	NGT2 ________
NSL1 ________	(dimensionless)	NSL2 ________
NST1 ________	(dimensionless)	NST2 ________
RHØ21 ________	(lbm/ft^3)	RHØ22 ________

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DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542	MEMO NO.	SECTION NO.	CONTINUATION SHEET / PAGE OF PAGES

INPUT ATMOSPHERE OPTION

For use with all options except LØPT = 4 (input wind tunnel conditions); if used with LØPT = 4, wind tunnel conditions override the input atmosphere.

IATMØS* ____________ (0) If > 0 use input atmosphere for UPBNDZ ≥ Z > DNBNDZ, and standard atmosphere for Z outside this range. Maximum of 50 values allowed.

UPBNDZ ________ (0.0 ft) DNBNDZ ____________ (0.0 ft)

NOTE Table must be input with lowest value of altitude first.

TBATMZ (ft.)	TABRHØ (lbm/ft^3)	TABSND (ft/sec)

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DIGITAL COMPUTER INPUT REQUEST FORM	2542	MEMO NO.	SECTION NO.	CONTINUATION ... PAGE

ACCURACY LIMITS ON INTEGRATED QUANTITIES

DELIN __________ (-2000. ft) Maximum allowable value for delta of integration in altitude. The minimum is set inside program as one foot.

V	CHIGH(1)	________	CDØWN(1)	________
γ	CHIGH(2)	________	CDØWN(2)	________
time	CHIGH(3)	________	CDØWN(3)	________
N_r	CHIGH(4)	________	CDØWN(4)	________
W	CHIGH(5)	________	CDØWN(5)	________
Rn	CHIGH(6)	________	CDØWN(6)	________
Rb	CHIGH(7)	________	CDØWN(7)	________
ψ	CHIGH(8)	________	CDØWN(8)	________
α	CHIGH(9)	________	CDØWN(9)	________
ρ	CHIGH(10)	________	CDØWN(10)	________
Q	CHIGH(11)	________	CDØWN(11)	________
R	CHIGH(12)	________	CDØWN(12)	________
P	CHIGH(13)	________	CDØWN(13)	________
γ_r	CHIGH(14)	________	CDØWN(14)	________
ψ_a	CHIGH(15)	________	CDØWN(15)	________
W_{th}	CHIGH(16)	________	CDØWN(16)	________

All the CHIGH's are preset to 1.0D-4 and all the CDØWN's to 1.0D-5. If the absolute value of the quantity being integrated is less than or equal to 1, then UPBND(N) = CHIGH(N) and DNBND(N) = CDØWN(N). If the absolute value, TEM(N) is greater than 1, then UPBND(N) = CHIGH(N) x TEM(N) and DNBND(N) = CDØWN(N) x TEM(N).

UPBND: The upper bound on absolute difference that is allowed between the extrapolated and interpolated values. If this bound <u>is exceeded by</u> the difference, the delta of integration is reduced and the integration retried.

DNBND: The lower bound on absolute difference that is allowed between the extrapolated and interpolated values. If this bound <u>exceeds</u> the difference, the delta of integration is increased and integration is carried on.

NOTE* $W = W_{INITIAL} - \Delta W_{ABLATION}$; $W_{TH} = W_{INITIAL} - \Delta W_{THRUST}$

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DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO: 2542	PROGRAMMER:
	TITLE:	

MEMO NO.	SECTION NO.	WORK ORDER NO.	(E240 USE ONLY)	REQUESTED BY:	EXT.	EST. TIME	PAGE OF PAGES

WIND TUNNEL CONDITIONS INPUT

Drag calculations are made for the specified geometry under the conditions indicated by each set of tabular inputs. Mass loss effects may be included. WTZ is an artificial altitude input which is tested against the transition altitude, either input or calculated, to indicate whether calculation is to be made using laminar or turbulent flow equations when the XBAR and XBAR1 tests indicate continuum flow regime. ********* NOTE*********** Plotting, input drag, input atmospheres, thrust, and tape options may not be used. Input material option may be used. Cases using this option may be stacked with those of other options.

MEMØ________ CASE________ DATE________

H____ ________________

LØPT* 4 MXTAB1* 1 MØDE* 1

NGEØM*________ (1) = 1 Input W, Rn, Rb, Theta
= 2 Input W, Rb, Theta, Lambda
= 3 Input W, Rn, Rb, La

W1________ (lb) RN1________ (in.) RB1________ (in.)

THETA1________ (deg) LAMDA1________ LA1________ (in.)

TXCGD1 0.0 TABI1 1.0 (slug-ft^2) TABIX1 1.0 (slug-ft^2)

Mass loss option is used only to obtain $\dot{m}$ and $\dot{W}$ for use in skin friction drag coefficient and base drag coefficient, respectively.

MØPT*________ MHEAT*________ (0) TWST________ (580. °R)

MATLN1*________ (1) TW1________ (1200. °R) TINIT________ (500. °R)

TRZTR________ (0.0ft) XUP________ (6.0) XLØW________ (4.0)

XIUP________ (0.4) X1LOW________ (0.2)

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DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542	MEMO NO.	SECTION NO.	CONTINUATION SHEET PAGE OF PAGES

MAXVAL*____________ No. of values in table: max. of 75 values

WTZ (ft.)	WTMINF	WTRINF (1/in.)	WTPTØT (lb/ft^2)	ALPTAB (deg.)

***** NOTE *****

WTMINF must be greater than 5.

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DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO: 2542	PROGRAMMER:
	TITLE:	

MEMO NO.	SECTION NO.	FORM ORDER NO.	(3240 USE ONLY)	REQUESTED BY	EXT.	EST. TIME	PAGE OF PAGES

INPUT TRAJECTORY OPTION

Drag calculations are made for the geometry and flight conditions specified by each set of tabular inputs. Mass loss effects may be included. TRAJ Z, input altitude, is tested against the transition altitude, either input or calculated, to indicate whether calculation is to be made using laminar or turbulent flow equations when the XBAR and XBAR1 tests indicate continuum flow regime.

***** NOTE ***** Plotting, input drag, thrust, and tape options may not be used in conjunction with this option. Input material and input atmosphere options may be used. Cases using this option may be stacked with those of other options.

MEMØ________ CASE________ DATE________

H________

LØPT* 3 MXTAB1* 1 MØDE* 1

NGEØM*________ (1) = 1 Input W, Rn, Rb, and Theta
= 2 Input W, Rb, Theta, and Lambda
= 3 Input W, Rn, Rb, and La

Configuration at first altitude

W1________ (lb.) RN1________ (in.) RB1________ (in.)

THETA1________ (deg.) LAMDA1________ LA1________ (in.)

TXCGD1 0.0 TABI1 1.0 (slug-ft^2) TABIX1 1.0 (slug-ft^2)

*****NOTE***** All appropriate configuration parameters, as specified by the NGEØM code, must be input.

Rn, Lambda, and La are changed with altitude by inputting variation in TRAJRN. Both TRAJRN and TRAJW must be input in addition to the NGEØM specifications for shape and weight.

Mass loss option is used only to obtain $\dot{m}$ and W for use in skin friction drag coefficient and base drag coefficient, respectively.

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DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542	MEMO NO.	SECTION NO.	CONTINUATION SHEET PAGE OF PAGES

MØPT*__________ MHEAT*__________ (0) TWST__________ (580. °R)

MATLN1*__________ (1) TW1__________ (1200. °R) TINIT__________ (500. °R)

TRZTR__________ (0. 0 ft) XUP__________ (6. 0) XLØW__________ (4. 0)

X1UP__________ (0. 4) X1LØW__________ (0. 2)

MAXVAL*__________ (No. of values in table; max. of 75 values)

TRAJT (sec)	TRAJZ (ft.)	TRAJV (ft/sec)	TRAJW(lb)	TRAJRN (in.)	TRJALP (deg)

NOTE **TRAJT need not be actual time values unless correct integrating heating is needed; may be used merely as a counter.**

APPENDIX 2

INPUT SHEETS FOR SAMPLE PROBLEMS

6

DIGITAL COMPUTER REPORT REQUEST FORM	PROBLEM NO. 2542	PROGRAMMER
	TITLE	

JOB NO.	SECTION NO.	COST ORDER NO.	(EPO USE ONLY)	REQUESTED BY	EXT.	EST. TIME	PAGE 1 of 13

HEADING CARD

RUN 1.0 CASE 1.0 DATE 10.07

H ADTECH IV EXAMPLE PRØBLEMS, REENTRY VEHICLE

*MØDE ____ (5) *IREF ____ (1) *NDECØY ____ (1) *NDVCH ____ (1)

PRINT CØNTRØLS *NPRINT 0

ZPR1 ____ (10000.0 ft.) Initial altitude increment.

ZBAR ____ (-1.0 E 4 ft.) Altitude for increment change.

ZPR2 ____ (ft.) Second altitude increment.

PRØGRAM STØPS

TST ____ (100.0 sec.) ZST 70000.0 (0.0 ft.) ALST ____ (0.0°)

TRAJECTØRY INPUTS

LØPT* ____ (1)
= 0 Rotational Trajectory
= 1 Particle Trajectory
= 2 Simplified Angle of Attack Trajectory

ZO 300000.0 (ft.) GAMFO -20.0 (deg.) VO 23000.0 (ft/sec)

XRO ____ (0.0 ft.) TO ____ (sec.)

TRZTR ____ (ft.) If > 0.0 overrides calculated transition altitude

If LØPT* = 2

THEALO ____ (deg.) TECØN ____ (2.0 sec.)

If LØPT* = 0

PO ____ (rad/sec) QO ____ (rad/sec) SMRO ____ (rad/sec)

PSIO ____ (deg.) THEALO ____ (deg.) PHIO ____ (deg.)

TCRIT 1.0 D-5 (sec.) TECØN 1.0 D-5 (sec.)

*NOTE*** 1. Pre-set values and required units for dimensional quantities are indicated in parentheses.

2. Starred quantities are input with no decimal point; all other inputs require decimal points.

DIGITAL COMPUTER INPUT REQUEST FORM	PROJECT NO. 2542	MEMO NO.	SECTION NO.	CONTINUATION SHEET PAGE 2 OF 13 PAGES

CONFIGURATION

NGEØM* ______ (1)
= 1 Input W, RN, RB, and THETA.
= 2 Input W, RB, THETA, and LAMDA.
= 3 Input W, RN, RB, and LA.

IKCMQ* ______ If > 0 input c_{m_q} CMQIN1 ______ First config. input CMQ

W1 500.0 (lb.) RN1 1.0 (in.) RB1 15.0 (in.)

THETA1 8.0 (deg.) LAMDA1 ______ LA1 ______ (in.)

for MXTAB1 = 1 omit TABZ1; for MXTAB2 = 1 omit TABZ2.

MXTAB1* ______ (1) Number of table entries - maximum of 50.

TABZ1 (ft.)	TXCGD1	TABI1 (1.slug - ft^2)	TABIX1 (1.slug - ft^2)

If the option for discontinuous change in geometry is exercised, ZTURN > 0, all quantities corresponding to the selected NGEØM, IKCMQ must be input.

ZTURN ______ (-1.0 ft.) Altitude at which configuration changes.

W2 ______ (lb.) RN2 ______ (in.) RB2 ______ (in.)

THETA2 ______ (deg.) LAMDA2 ______ LA2 ______ (in.)

MXTAB2* ______ (1) CMQIN2 ______

TABZ2 (ft.)	TXCGD2	TABI2 (1.slug - ft^2)	TABIX2 (1.slug - ft^2)

MASS LØSS

MØPT* 1 MHEAT* 1 (0) NØSEØP* 1

MATIN1* 3 (1) TW1 4850.0 (1200.°R)

If ZTURN > 0, input MATIN2 and TW2.

MATIN2* ______ (1) TW2 ______ (1200.°R)

The material number values for built-in properties are as follows: TEFLON is 1, INT... is 2, OTWR is 3, Phenolic Nylon is 4, Carbon Phenolic is 5, input material properties is 6.

TWST ______ (580°R) TINIT ______ (500.0°R)

C ______ (1.0) Multiplier on stag. point heating; simulates nose tip of a different material by changing the nose recession and mass loss characteristics; the correct qstag is printed in output.

5

2-5904 5-63

DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542	MEMO NO.	SECTION NO.	CONTINUATION SHEET PAGE 3 OF 13 PAGES

ACØN ________ (1.0)
AKW ________ (50. BTU/FT-°R-HR)
BCØN ________ (1.0)
B21 ________ (1.0)
B22 ________ (0.25)
B23 ________ (0.0)
CCØN ________ (1.0)
CRHØW ________ (0.75 BTU/lb-°R)
DELWH ________ (0.01 in.)
DHCHEM ________ (0.0 FT²/sec²)
*IND ________ (0)
RHØSL ________ (0.08042 lb/ft³)
RHØW ________ (115. lb/ft³)
RTO ________ (8.475E5 ft²/sec²)
TABL 2700.0 (1500. °K)

CNUMB(59) ____ (0.66)
(60) ____ (1.2)
(83) ____ (4.4E26)
(84) ____ (0.0)
(91) ____ (6.7216E14)
(115) ____ (1.0E11)
(135) ____ (1.0E-10)
(159) ____ (0.66)
(160) ____ (120.0)

CNUMB(64) ____ (0.0)
(65) ____ (0.0)
(66) ____ (0.25)
(67) ____ (0.5)
(85) ____ (1.0)
(86) ____ (0.0)
(87) ____ (1.0)
(88) ____ (0.0)
(89) ____ (1.0)
(90) ____ (1.0)
(92) ____ (0.0)
(93) ____ (1.0)
(100) ____ (0.0)
(116) ____ (0.00)
(117) ____ (1.0)
(118) ____ (1.0)
(119) ____ (0.00)
(120) ____ (0.0)
(121) ____ (0.0)
(122) ____ (1.0)
(123) ____ (5.E12)
(124) ____ (-1.5)
(125) ____ (1.0)
(130) ____ (1.0)
(131) ____ (0.0)

CNUMB(132) ____ (1.0)
(133) ____ (0.0)
(134) ____ (2.0)
(136) ____ (0.0)
(164) ____ (0.0)
(165) ____ (86.0)
(169) ____ (1.0)
BZERØ ________ (5.8E-21)
B2 ________ (4.0E-10)
B3 ________ (2.0)
BTWEN ________ (1.0)
B24 ________ (1.0E-26)
CNUMB(1) ____ (0.02)
(2) ____ (2.0)
(3) ____ (1.0)
(4) ____ (0.0)
(5) ____ (0.5)
DX ________ (50.0)
*IND2 ________ (0)
*NSTWL ________ (100)
ENUS ________ (2.0E11)

CNE ________ (0.0)
DSB ________ (0.0)
X2BØD ________ (0.0)
X3B ________ (0.0)

*IDBL 3 (1) *IØP (34) 1 (37) 1 ( ) __ ( ) __

*IWAKE ____ (2) WSTALT 160000.0 (180000.) *IWPRNT ____ (0)

	WKALT	BETAZ	PHI1	PHI2	PHI3
1	300000.0	22.0	7.0		
2	0.0	22.0	7.0		
3					
4					
5					
6					
7					
8					
9					
10					

FRQ1 ________ (4.355E8 cps)
SIGNL1 ________ (1.0E-6 m²)
TAU1 ________ (1.0 μ sec)

FRQ2 ________ (1.375E9 cps)
SIGNL2 ________ (1.0E-6 m²)
TAU2 ________ (1.0 μ sec)

FRQ3 ________ (5.4E9 cps)
SIGNL3 ________ (1.0E-6 m²)
TAU3 ________ (0.4 μ sec)

DIGITAL COMPUTER INPUT REQUEST FORM	2540			CONTINUATION SHEET PAGE 4 OF 13 PAGES

CASE 2.0 DATE ______ MEMØ ______

H DECØY ØPTIMIZATIØN EXAMPLE

*MØDE ____ (3) *ICØM(1) ____ (0) *IREF 2 (1) *MØPT ____ (0)

A

*IPRØC 4 (1) XCØM(1) ____ (1.0) ERR ____ (0.01) *ICØM(3) ____ (0)

*LIMIT 200 (30) (2) ____ (0.5) FAC ____ (1.0) *LRED 6 (0)

*IEX ____ (2) (3) ____ (0.5) DELTA ____ (1.0) WRF 0.8 (0.9)

SMULT (1-29) ____ (1.0) (4) ____ (0.01)

(5) ____ (0.5)

(6) ____ (1.0E-4)

*IN 2 (1)

*IINØ	DELX	ALØW	UP	ØVECT
136	0.1			2.5
138	1.0			20.0

*NCØNS 10 (1)

*IDC	AMULT	CALØW	CTP
133	1.0	0.0	40.0
3915	1.0E-5	0.0	0.0
3941	1.0E-5	0.0	0.0
3944	1.0E-5	0.0	0.0
136	1.0	1.5	4.0
138	1.0	15.0	48.0
134	1.0	4.0	12.0
137	1.0	0.0	0.5
3965	0.0	0.0	0.0
3962	0.0	0.0	0.0

7.

DIGITAL COMPUTER INPUT REQUEST FORM	2542			CONFIGURATION PAGE 5 OF 13 PAGES

CONFIGURATION

NGEØM* 3 (1)

= 1 Input W, RN, RB, and THETA.
= 2 Input W, RB, THETA, and LAMDA.
= 3 Input W, RN, RB, and LA.

IKCMQ* ________ If > 0 input c_{m_q} CMQIN1 ________ First config. input ...

W1 40.0 (lb.) RN1 0.1 (in.) RB1 ________ (in.)

THETA1 ________ (deg.) LAMDA1 ________ LA1 ________ (in.)

for NZTAB1 = 1 omit TABZ1; for NZTAB2 = 1 omit TABZ2.

NZTAB1* ________ (1) Number of table entries - maximum of 50.

TABZ1 (ft.)	TXCGD1	TABI1 (1.slug - ft^2)	TABIY1 (1.slug - ft^2)

If the option for discontinuous change in geometry is exercised, ZTURN > 0, all quantities corresponding to the selected NGEØM, IKCMQ must be input.

ZTURN ________ (-1.0 ft.) Altitude at which configuration changes.

W2 ________ (lb.) RN2 ________ (in.) RB2 ________ (in.)

THETA2 ________ (deg.) LAMDA2 ________ LA2 ________ (in.)

NZTAB2* ________ (1) CMQIN2 ________

TABZ2 (ft.)	TXCGD2	TABI2 (1.slug - ft^2)	TABIX2 (1.slug - ft^2)

MASS LØSS

KØUT* ________ MHEAT* ________ (0) NØSEØP* ________

MATIN1* ________ (1) TW1 ________ (1200.°R)

If ZTURN > 0, input MATIN2 and TW2.

MATIN2* ________ (1) TW2 ________ (1200.°R)

The material number values for built-in properties are as follows: TEFLON is 1, ... is 2, OTWR is 3, Phenolic Nylon is 4, Carbon Phenolic is 5, input material properties is 6.

TWST ________ (560°R) TINIT ________ (500.0°R)

C ________ (1.0) Multiplier on stag. point heating; simulates nose tip of a different material by changing the nose recession and mass loss characteristics; the correct qstag is printed in output.

3

DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542			CONTINUATION SHEET PAGE 6 OF 13 PAGES

*NCP 5
*IDBL ___ (I)
PFD 0.001 (DP)

*IΦP(1) 0 (I)	*IΦP(2) 0 (I)	*IΦP(3) 0 (I)	*IΦP(22) ___ (I)
(4) 1 (I)	(5) 0 (I)	(6) 0 (I)	(28) 1 (I)
(7) 1 (I)	(8) 0 (I)	(9) 0 (I)	(34) 1 (I)
(10) 0 (I)	(11) 0 (I)	(12) 0 (I)	(40) ___ (I)
(13) 0 (I)	(14) 0 (I)	(15) 0 (I)	(46) ___ (I)
(16) 0 (I)	(17) 0 (I)	(18) 0 (I)	(52) ___ (I)
(19) 0 (I)	(20) 0 (I)	(21) 0 (I)	(58) ___ (I)
			(77) ___ (I)
AA (1) ___ (0.)	AA (4) ___ (0.)	AA (7) ___ (0.)	AA (10) ___ (0.)
(2) ___ (0.)	(5) ___ (0.)	(8) ___ (0.)	(11) ___ (0.)
(3) ___ (1.)	(6) ___ (1.)	(9) ___ (1.)	(12) ___ (1.)
SRS(1) 1.0 (0.)	SRS(2) ___ (0.)	SRS(3) ___ (0.)	SRS(4) 1.0 (0.)

	H	BCY	TCY	SY	BCD	TCD	SD	BCB	TCB	SB	BCWL1	TCWL1	SWL1
1	300000.0	-30.0	30.0	30.0							-400.0	650.0	400.0
2	200000.0	-40.0	40.0	40.0							-400.0	600.0	400.0
3	150000.0	-110.0	110.0	110.0							-300.0	550.0	300.0
4	100000.0	-170.0	170.0	170.0							-190.0	350.0	190.0
5	70000.0	-200.0	200.0	200.0							-100.0	200.0	100.0
6													
7													
8													
9													
10													
11													
12													
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15													
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18													
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26													
27													
28													

4

DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542	PROGRAM NO.	SECTION NO.	CONTINUATION SHEET PAGE 7 OF 13 PAGES

*IΦP(23) ____ (0)	*IΦP(24) ____ (0)	*IΦP(25) ____ (0)	*IΦP(26) ____ (0)	*IΦP(27) ____ (0)
(29) ____ (0)	(30) ____ (0)	(31) 1 (0)	(32) ____ (0)	(33) ____ (0)
(35) ____ (0)	(36) ____ (0)	(37) 1 (0)	(38) ____ (0)	(39) ____ (0)
(41) ____ (0)	(42) ____ (0)	(43) ____ (0)	(44) ____ (0)	(45) ____ (0)
(47) ____ (0)	(48) ____ (0)	(49) ____ (0)	(50) ____ (0)	(51) ____ (0)
(53) ____ (0)	(54) ____ (0)	(55) ____ (0)	(56) ____ (0)	(57) ____ (0)
(59) ____ (0)	(60) ____ (0)	(61) ____ (0)	(62) ____ (0)	(63) ____ (0)
(78) ____ (0)	(79) ____ (0)	(80) ____ (0)	(81) ____ (0)	(82) ____ (0)
AA(13) ____ (0.)	AA(16) ____ (0.)	AA(19) ____ (0.)	AA(22) ____ (0.)	AA(25) ____ (0.)
(14) ____ (0.)	(17) ____ (0.)	(20) ____ (0.)	(23) ____ (0.)	(26) ____ (0.)
(15) ____ (1.)	(18) ____ (1.)	(21) ____ (1.)	(24) ____ (1.)	(27) ____ (1.)
SRS(5) ____ (40)	SRS(6) ____ (40)	SRS(7) 1.0 (40)	SRS(8) ____ (40)	SRS(9) ____ (40)

BCWL2	TCWL2	SWL2	BCWL3	TCWL3	SWL3	BCWR1	TCWR1	SWR1	BCWR2	TCWR2	SWR2	BCWR3	TCWR3	SWR3
						-40.0	30.0	10.0						
						-40.0	30.0	10.0						
						-48.0	38.0	10.0						
						-56.0	46.0	10.0						
						-60.0	50.0	10.0						

DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542	MEMO NO.	SECTION NO.	CONTINUATION SHEET PAGE 8 OF 13 PAGES

CASE 3.0 DATE ______ MEMØ ______

H DECØY EVALUATION WITH PLØTS

*MØDE ____ (3) *ICØM(1) ____ (0) *IREF ____ (1) *MØPT ____ (0)

A

*IPRØC 2 (1) XCØM(1) ____ (3.0) ERR ____ (0.01) *ICØM(3) ____ (0)

*LIMIT ____ (30) (2) ____ (0.5) FAC ____ (1.0) *LRED 0 (0)

*IEX ____ (2) (3) ____ (0.5) DELTA ____ (1.0) WRF ____ (0.9)

SMULT (1-25) ____ (10) (4) ____ (0.01) *NPLØT 1 1 1

(5) ____ (0.5) *IØP(1) 1 (22) 1 (25) 1

(6) ____ (1.0E-4) *IØP (77) 1 (80) 1

*IN ____ (1)

*IDNØ	DELX	ALØW	UP	ØVECT
				3.20
				23.0

*IØP(13) 1 (46) 1 (49) 1 W1 20.48

*NCØNS ____ (1)

*IDC	AMULT	CALØW	CTP

DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO.	MEMO NO.	SECTION NO.	CONTINUATION SHEET PAGE 9 OF 12 PAGES

CASE 4.0 DATE ______ MEMØ ______

H ROSENBRØCK UNCØNSTRAINED ØPTIMIZER EXAMPLE

*MØDE 3 (3) *ICØM(1) 1 (0) *IREF 2 (1) *MØPT 5 (0)

A 0.625 -0.75 0.625 -1.75 0.25 2.625

*IPRØC 4 (1) XCØM(1) ______ (3.0) ERR ______ (0.01) *ICØM(3) 0 (0)

*LIMIT 200 (20) (2) ______ (0.5) FAC ______ (1.0) *LRED 0 (0)

*IDX 1 (2) (3) ______ (0.5) DELTA ______ (10) WRF ______ (0.9)

MULT (1-29) ______ (1) (4) ______ (0.01)

(5) ______ (0.5)

(6) ______ (1.0E-4)

*IN 2 (1)

*IDEØ	DELX	ALØW	UP	ØVECT
1	0.01			0.0
2	0.01			0.0

*NCØNS 1 (1)

*IDC	AMULT	CALØW	CTP
400	1.0	0.0	0.0

DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO.	MEMO NO.	SECTION NO.	CONTINUATION SHEET
	2542			PAGE 10 OF 15 PAGES

CASE 50 DATE ______ MEMØ ______

H DAVIDØN UNCØNSTRAINED ØPTIMIZER EXAMPLE

*MØDE 3 (3) *ICØM(1) 1 (0) *IREF 2 (1) *MØPT 5 (0)

A 0.625 -0.75 0.625 -1.75 0.25 2.625

*IPRØC 3 (1) XCØM(1) ______ (3.0) ERR 0.0005 (0.01) *ICØM(3) 0 (0)

*LIMIT 30 (30) (2) ______ (0.5) FAC 1.0 (1.0) *LRED 0 (0)

*IDX 1 (2) (3) ______ (0.5) DELTA 1.0 (1.0) WRF ______ (0.9)

SMULT (1-25) ______ (10) (4) ______ (0.01)

(5) ______ (0.5)

(6) ______ (1.0E-4)

*IN 2 (1)

*IDNØ	DELX	ALØW	UP	ØVECT
1	0.0001			0.0
2	0.0001			0.0

*NCØNS 1 (1)

*ILC	AMULT	CALØW	CTP
400	1.0	0.0	0.0

DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2[illegible]	MEMO NO.	SECTION NO.	CONTINUATION SHEET PAGE 11 OF 1[illegible] PAGES

CASE 6.0 DATE ______ MEMØ ______

H TWØ-VARIABLE FIBONACCI EXAMPLE

*MØDE 3 (3) *ICØM(1) 1 (0) *IREF 2 (1) *MØPT 5 (0)

A 0.625 -0.75 0.625 -1.75 0.25 2.625

*IPHØC 5 (1) XCØM(1) ______ (3.0) ERR ______ (0.01) *ICØM(2) 0 (0)

*LIMIT 12 (30) (2) ______ (0.5) FAC ______ (1.0) *LKED 0 (0)

*TEX 1 (2) (3) ______ (0.5) DELTA ______ (1.0) WRF ______ (0.9)

SMULT (1-2) ______ (1.0) (4) ______ (0.01)

(5) ______ (0.5)

(6) ______ (1.0E-4)

*IN 2 (1)

*IDNØ	DELX	ALØW	UI	ØVECT
1		-10.0	10.0	
2		-10.0	10.0	

*NCØNS 1 (1)

*IDC	AMULT	CALØW	CTP
400	1.0	0.0	0.0

DIGITAL COMPUTER INPUT REQUEST FORM	PROBLEM NO. 2542	MEMO NO.	SECTION NO.	CONTINUATION SHEET PAGE 12 OF 13 PAGES

CASE 7.0 DATE ______ MEMO ______

H ROSENBROCK DESIGN VARIABLE OPTIMIZER, CONSTRAINED

*MODE 3 (3) *ICOM(1) 1 (0) *IREF 2 (1) *MOPT 5 (0)

A 0.625 -0.75 0.625 -1.75 0.25 2.625

*IPROC 4 (1) XCOM(1) ______ (2.0) ERR ______ (0.01) *ICOM(3) 0 (0)

*LIMIT 200 (30) (2) ______ (0.5) FAC ______ (1.0) *LRED 20 (0)

*IDX 2 (2) (3) ______ (0.5) DELTA ______ (1.0) WRF 0.9 (0.9)

SMULT (1-22) ______ (1.0) (4) ______ (0.01)

(5) ______ (0.5)

(6) ______ (1.0E-4)

*N 2 (1)

*IDNO	DELX	ALOW	UP	OVECT
1	0.01			1.0
2	0.01			2.0

*NCONS 2 (1)

*IDC	AMULT	CALOW	CTP
2	1.0	-10.0	2.5
400	1.0	0.0	1.1

[illegible]	PROGRAM NO. 2940	MEMO NO.	SECTION NO.	CONTINUATION SHEET PAGE 13 OF 13 PAGES

CASE 8.0 DATE ______ MEMØ ______

[illegible]

[illegible] 3 (3) [illegible]CØM(1) 1 (0) IREF 2 (1) [illegible] 5 (0)

A 0.625 -0.75 0.625 -1.75 0.25 2.[illegible]

IPRØC 1 (0) XCØM(1) ______ (F 0) ERR ______ ([illegible]) [illegible]CØM(3) ______ (0)

LIMIT 12 (30) (2) ______ (0.5) FAC ______ (1.0) LRED 0 ([illegible]

[illegible] 1 ([illegible]) (3) ______ (0.5) DELTA ______ (1.0) WRF ______ ([illegible]

SHIFT (1-25) ______ ([illegible]) (4) ______ (0.01) ØCCUR (2) 1.0

(5) ______ ([illegible])

(6) ______ ([illegible])

[illegible] 1 (1)

*IDNØ	DELX	ALØW	UP	ØVECT
1		-10.0	[illegible].0	

NOT REPRODUCIBLE

[illegible] 1 (1)

*IDC	AMULT	CALØW	CTP
400	1.0	0.0	0.0

```
 MEMØ  1.0 CASE  1.0 DATE  10.07
H ADTECH IV EXAMPLE PROBLEMS, REENTRY VEHICLE                                  2241
 NPRINT  0 ZST  70000.0 Z1  300000.0 GAMF0  -20.0 V0  23000.0                  2241
 W1  500.0 RN1  1.0 RB1  15.0 THETA1  8.0 MØPT  1 MHEAT  1 NØSEØP  1           2241
 MATLN1  3 TW1  4850.0 TABL  2700.0 IDBL  3 IOP(34)  1 (37)  1                 2241
 WSTALT  160000.0 WKALT  300000.0  0.0 BETAZ  22.0  22.0                       2241
 PHI1  7.0  7.0                                                                 2241
1                                                                               2241
 CASE  2.0
H DECOY ØPTIMIZATION EXAMPLE                                                   2241-2
 IREF  2 IPRØC  4 LIMIT  200 LRED  6 WRF  0.8 IN  2   RN1  0.1                 2241-2
 IDNO  136  138       DELX  0.1  1.0          ØVECT  2.5  20.0
 NCØNS  10                                                                      2241-2
 IDC  133  3915  3941  3944  136  138       134  137  3965  3962
 AMULT  1.0  .00001  .00001  .00001  1.0  1.0  1.0  1.0  0.0  0.0              2241-2
 CALOW  0.0  0.0  0.0  0.0  1.5  15.0       4.0  0.0  0.0  0.0
 CTP  40.0  0.0  0.0  0.0  4.0  48.0        12.0  0.2  0.0  0.0
 NGEØM  3 W1  40.0 NCP  5 PFD  0.001
 IØP(1)  0  0  0  1  0  0  1  0  0  0  0  0                                    2241-2
 (28)  1 (34)  1 SRS(1)  1.0 (4)  1.0                                           2241-2
 H  300000.0  200000.0  150000.0  100000.0  70000.0                             2241-2
 IØP(31)  1 (37)  1 SRS(7)  1.0                                                 2241-2
 BCV  -30.0  -40.0  -110.0  -170.0  -200.0                                      2241-2
 TCV  30.0  40.0  110.0  170.0  200.0                                           2241-2
 SV  30.0  40.0  110.0  170.0  200.0
 BCWL1  -400.0  -400.0  -300.0  -180.0  -100.0
 TCWL1  650.0  600.0  550.0  350.0  200.0                                       2241-2
 SWL1  400.0  400.0  300.0  180.0  100.0
 SWR1  10.0  10.0  10.0  10.0  10.0                                             2241-2
 BCWR1  -40.0  -40.0  -48.0  -56.0  -60.0                                       2241-2
 TCWR1  30.0  30.0  38.0  46.0  50.0
1                                                                               2241-2
 CASE  3.0
H DECØY EVALUATIØN WITH PLØTS                                                  2241-3
 IPRØC  2 NPLØT  1  1  1 IØP(1)  1 (22)  1 (25)  1 (77)  1 (80)  1             2241-3
 IØP(13)  1 (46)  1 (49)  1                                                     2241-3
 ØVECT  3.20  25.0  W1  20.48                                                   2241-3
 LRED  0
1
 CASE  4.0
H RØSENBRØCK UNCONSTRAINED ØPTIMIZER EXAMPLE                                   2241-4
 MØDE  3 ICØM(1)  1 IREF  2 MØPT  5 A  0.625  -0.75  0.625  -1.75              2241-4
 0.25  2.625 IPROC  4 ICØM(3)  0 LIMIT  200 LRED  0 IEX  1 IN  2               2241-4
 IDNØ  1  2 DELX  0.01  0.01 ØVECT  0.0  0.0 NCØNS  1 IDC  400                 2241-4
 AMULT  1.0 CALØW  0.0 CTP  0.0                                                 2241-4
1                                                                               2241-4
 CASE  5.0
H DAVIDØN UNCØNSTRAINED ØPTIMIZER EXAMPLE                                      2241-5
 MØDE  3 ICØM(1)  1 IREF  2 MØPT  5 A  0.625  -0.75  0.625  -1.75              2241-5
 0.25  2.625 IPRØC  3 ERR  0.0005 ICØM(3)  0 LIMIT  30 FAC  1.0                2241-5
 LRED  0 IEX  1 DELTA  1.0 IN  2 IDNØ  1  2 DELX  0.0001  0.0001               2241-5
 ØVECT  0.0  0.0 NCØNS  1 IDC  400 AMULT  1.0 CALØW  0.0 CTP  0.0              2241-5
1                                                                               2241-5
 CASE  6.0
H TWØ-VARIABLE FIBØNACCI EXAMPLE                                               2241-6
 MØDE  3 ICØM(1)  1 IREF  2 MØPT  5 A  0.625  -0.75  0.625  -1.75              2241-6
 0.25  2.625 IPRØC  5 ICØM(3)  0 LIMIT  12 LRED  0 IEX  1 IN  2                2241-6
 IDNØ  1  2 ALØW  -10.0  -10.0 UP  10.0  10.0 NCØNS  1 IDC  400                2241-6
 AMULT  1.0 CALØW  0.0 CTP  0.0                                                 2241-6
1                                                                               2241-6
```

```
 CASE  7.0                                                                   2241-7
H ROSENBROCK DESIGN VARIABLE OPTIMIZER, CONSTRAINED                           2241-7
 MODE  3 ICOM(1)  1 IREF  2 MOPT  5 A  0.625  -0.75  0.625  -1.75  0.25 2241-7
 2.625 IPROC  4 ICOM(3)  0 LIMIT  200 LRED  20 IEX  2 IN  2               2241-7
 IDNO  1  2 DELX  0.01  0.01 OVECT  1.0  2.0 NCONS  2 IDC  2  400          2241-7
 AMULT  1.0  1.0 CALOW  -10.0  0.0 CTP  2.5  1.1                          2241-7
 WRF  0.9                                                                  2241-7
1
 CASE  8.0                                                                 2241-8
H ONE VARIABLE FIBONACCI EXAMPLE                                           2241-8
 MODE  3 ICOM(1)  1 IREF  2 MOPT  5 A  0.625  -0.75  0.625  -1.75         2241-8
 0.25 2.625 IPROC  1 LIMIT  12 IEX  1 OCCUR(2)  1.0 IN  1                  2241-8
 IDNO  1 ALOW  -10.0 UP  10.0 NCONS  1 IDC  400 AMULT  1.0                 2241-8
 CALOW  0.0 CTP  0.0                                                       2241-8
 LRED  0
1
END-OF-JOB
/*
```

APPENDIX 3

PRINTOUT FROM SAMPLE PROBLEMS

P25A2F

BIN 14

J0B 0042

11 07 68

```
//P2542F JOB (4143E510010,00000,116,030,LORRAINE,              ,K240),14,X
//             MSGLEVEL=1
/*SETUP DDNAME=SC4020,DEVICE=2400-7,ID=(SCRTCHH,RING,SAVE,NL)
/*SETUP   DDNAME=FT08F001,DEVICE=2400-9,ID=(EARL,RING,SAVE,NL)
/*FORMAT PR,FORMS='FOUR PLY'
// EXEC FORTHLG,PARM.LKED='MAP,LET,OVLY'
//LKED.SYSUT1 DD UNIT=SYSDA,SPACE=(1024,(400,50))
//LKED.SYSLMOD DD DSNAME=&GOSET(MAIN),UNIT=SYSDA,DISP=(,PASS),          X
//              SPACE=(3072,(200,20,1),RLSE)
//LKED.SYSLIN DD *
/*
//GO.SC4020 DD UNIT=TAPE7,LABEL=(,BLP)
//GO.FT08F001 DD UNIT=TAPE9,LABEL=(,BLP),VOLUME=SER=EARL
//GO.FT09F001 DD UNIT=SYSSQ,SPACE=(800,(1000,250))
//GO.SYSABEND DD SYSOUT=A
//GO.FT05F001 DD *
/*
MDS01 JOB 0042(P2542F  ) IN SETUP ON MAIN=SY1
MDS02 MOUNT SCRATCH ON 280,NL,RING   ,DD=SC4020
MDS02 MOUNT EARL    ON 184,NL,RING   ,DD=FT08F001
MDS16 OPERATOR ISSUED START SETUP
S=VERIFY 184,VOL=(NL,EARL)
R=IEF916I 184 EARL   VERIFIED
S=VERIFY 280,VOL=(NL,SCR280)
R=IEF916I 280 SCR280 VERIFIED
MSV02 JOB 0042,HAS EXCEEDED MAXIMUM LINES ON SY1
MDS06 JOB 0042(P2542F  ) IS IN BREAKDOWN
MDS07 SAVE 184(EARL   )
MDS07 SAVE 280(SCR280)
```

```
//P2542F JOB (K143E510010,00000,116,030,LORRAINE,------------,K240),14,X
//             MSGLEVEL=1
// EXEC FORTHLG,PARM.LKED='MAP,LET,OVLY'
//LKED   EXEC  PGM=IEWL,PARM='MAP,LET,LIST'                                    00000010
//SYSPRINT DD SYSOUT=A,DCB=(,RECFM=FBA,LRECL=121,BLKSIZE=1089)                 00000020
//SYSLIB  DD   DSNAME=SYS1.FORTLIB,DISP=SHR                                    00000030
//        DD   DSNAME=SYS1.DOUBLEP,DISP=SHR                                    00000040
//LKED.SYSUT1 DD UNIT=SYSDA,SPACE=(1024,(600,50))
X/SYSUT1     DD UNIT=SYSDA,SPACE=(1024,(300,50))                               00000050
//LKED.SYSLMOD DD DSNAME=&GOSET(MAIN),UNIT=SYSDA,DISP=(,PASS),                X
//             SP.CE=(3072,(200,20,1),RLSE)
X/SYSLMOD DD   DSNAME=&GOSET(MAIN),UNIT=SYSDA,DISP=(,PASS),                   X00000060
//             SPACE=(3072,(100,10,1),RLSE)                                    00000070
//LKED.SYSLIN DD *
IEF236I ALLOC. FOR P2542F   LKED
IEF237I SYSLIB   ON 291
IEF237I          ON 291
IEF237I SYSUT1   ON 291
IEF237I SYSLMOD  ON 292
IEF237I SYSLIN   ON 271
```

E-LEVEL LINKAGE EDITOR OPTIONS SPECIFIED MAP,LET,OVLY
****MAIN DOES NOT EXIST BUT HAS BEEN ADDED TO DATA SET

MODULE MAP

CONTROL SECTION				ENTRY							
NAME	ORIGIN	LENGTH	SEG. NO.	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION
$SEGTAB	00	34	1								
MAIN=	38	3312	1								
				MAIN	2CE0						
XXSAVE	3350	284	1								
IOPT	3508	1C	1								
FOPT	35F8	20	1								
MIN	3618	320	1								
$BLANKCOM	3938	7D78	1								
CCRN	B680	8	1								
IONOS	B688	190	1								
DWL	B848	AC	1								
BLEO	B8F8	47E8	1								
SENSE	100E0	8	1								
MALTFC	100E8	C	1								
C1...UR	100F8	500	1								
END	105F8	4	1								
MINSK	10600	1F0	1								
OOPT	107F0	A0	1								
LA000000	10890	13D5	1								
				READIN	10890	HEDING	1177A	WHERE	117B6	SETUP	1185C
ACOSR=	11C68	254	1								
				ACOSR	11CA8	ACOS	11DA0	ACOSD	11E50		
ADMARK=	11EC0	297C	1								
				ADMARK	138C8						
AERODY=	14840	10FE	1								
				AERODY	14870						
AIM=	15940	424	1								
				AIM	159A8						
BLKI	15E18	28	1								
ARFOT2=	15E40	174	1								
				ARFOT2	15E78						
AR2DIM=	15F88	370	1								
				AR2DIM	16010						
AR3DIM=	16328	40C	1								
				AR3DIM	163E0						
ASINR=	16738	254	1								
				ASINR	16778	ASIN	16870	ASIND	16920		
ATANQR=	16990	288	1								
				ATANQR	169E0	ATANQ	16AD8	ATANQD	16B94		
AVPLT=	16C18	1854	1								
				AVPLT	17438						
CPGGJR	18470	16FD0	1								
BESSEL=	2F440	402	1								
				BESSEL	2F460						
CHNTBL=	2F918	10A4	1								

NAME	ORIGIN	LENGTH	SEG. NO.
CLASSC=	309C0	520	1
DEREQ=	30EE0	648	1
COMP62=	31528	9F4	1
DIVMLT=	31F20	21C	1
DRAGCO=	32140	2096	1
DRESS=	341D8	786	1
EFFECT=	34960	3CC	1
DRLIM=	34D30	15E	1
FCN=	34E90	5A8	1
EVIL=	35438	12A4	1
NIRPUT	366E0	5B0	1
FEV=	36C90	654	1
FERROR=	372E8	7C	1
FIRE=	37368	3FC	1
IXCOM	37768	960	1
FIB1=	380C8	8FE	1
FLOWF=	389C8	1C98	1
TBLS12	3A660	17E8	1
FRLTNK	3BE48	B8	1
FNIMAX=	3BF00	1A4	1
F123=	3C0A8	1E26	1
CSIG	3DED0	94	1
FUNI=	3DF68	846	1
GMIMAX=	3E7B0	204	1
TTMCOM	3E9B8	640	1
INFTST	3EFF8	4	1
JNXBES=	3F000	F38	1
INTERP=	3FF38	2F6	1
HEADER=	40230	378	1

NAME	LOCATION	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION
CHNTBL	2FC80						
CLASSC	30AE8						
DEREQ	30FE0						
COMP62	31B10						
DIVMLT	31F80						
DRAGCO	326A8						
DRESS	342E8						
EFFECT	34A18						
DRLIM	34D68						
FCN	34F88						
EVIL	358F8						
FEV	36DF0						
FERROR	372E8						
FIRE	373D0						
FIB1	38310						
FLOWF	38FF8						
FMIMAX	3BF28						
F123	3C620						
FUNI	3E0F0						
GMIMAX	3E7E0						
JNXBES	3F310						
INTERP	3FF90						
HEADER	403F0						

NAME	ORIGIN	LENGTH	SEG. NO.	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION
LINFIT=	405A8	1F0	1	LINFIT	405C0						
LNTERP=	43798	3A6	1	LNTERP	407F8						
MASSLO=	40B40	28C	1	MASSLO	40B88						
MATMP=	40DD0	18C	1	MATMP	40DF0						
MATMPY=	40F90	18C	1	MATMPY	40FB0						
MAXMIN=	41120	27E	1	MAXMIN	41180						
MIBCOM=	413A0	7C	1	MIBCOM	413A0						
MISC=	41420	7CC	1	MISC	41650						
IGDHL	41BF0	A0	1								
NEUMAN=	41C90	9C8	1	NEUMAN	41F20						
NEUMNO=	42658	51E	1	NEUMNO	42750						
NEUMN1=	42878	5C2	1	NEUMN1	42C88						
NEUMPO=	43140	42C	1	NEUMPO	43240						
NEUMQO=	43570	46C	1	NEUMQO	43688						
NOSEBL=	439E0	18C	1	NOSEBL	43A30						
PLT=	43870	7C	1	PLT	43B70						
POLCAL=	43BF0	38C	1	POLCAL	43C68						
PRELIM=	43F80	15F4	1	PRELIM	443E8						
RANDOM=	45578	80	1	RANDOM	45588						
RCSEC=	45678	FEE	1	RCSEC	459E0						
SCREEN=	46618	D48	1	SCREEN	468E0						
GRCSEC	47360	68	1								
DRCSEC	473C8	60	1								
REDUCE=	47428	230	1	REDUCE	47458						
SAVEOV=	47658	212	1	SAVEOV	47680						
ROTATE=	47870	F84	1	ROTATE	47DC8						
RITOUT=	487F8	2C4	1	RITOUT	48888						
STUFF=	48AC0	2A0	1								

NAME	ORIGIN	LENGTH	SEG. NO.	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION
				STUFF	48B18						
MULT	48D60	C8	1								
TEQUAT=	48E28	5C8	1	TEQUAT	48F60						
TABLE=	493F0	284	1	TABLE	49430						
TIMERS=	49678	8A	1	TIMERS	49680						
TOMALO=	49738	4E0	1	TOMALO	49810						
WAKE=	49B98	EA6	1	WAKE	49C98						
INCUDPT *	4AA40	8	1								
CWAKE	4AA48	1EC	1								
INCNAREL*	4AC38	8A2	1	FRDNL=	4AC38	FWRNL=	4B100				
INCFCORN*	4B4E0	1000	1	IBCOM=	4B4E0	FDIOCS=	4B59C				
INCTRCH *	4C4F0	278	1								
INCFEXIT*	4C768	1C	1	EXIT	4C768						
INCFDXPI*	4C788	9C	1	FDXPI=	4C788						
INCLSQRT*	4C828	96	1	DSQRT	4C828						
INCLEXP *	4C8C0	1CC	1	DEXP	4C8C0						
INCLLOG *	4CA90	178	1	DLOG10	4CA90	DLOG	4CAAC				
INCFDXPD*	4CC08	D0	1	FDXPD=	4CC08						
INCLATN2*	4CCD8	1F4	1	DATAN2	4CCD8	DATAN	4CCF4				
PLINK *	4CED0	A94	1	OPENER	4CED0	PLTW1	4CEF8	PLTW2	4CF38	PLTW3	4D0A4
				PLTW3A	4D14C	PLTW4	4D1EA	PLTW5	4D2E0	PLTND	4D430
DECK1 *	4D968	124	1	SERSAV	4D968	SERAEV	4D98A	FLAGSV	4D9A6	LIST	4D9EA
				ZDDPTA	4D9E8	DXXSYY	4D9EC	XXXXDD	4D9F0	YYYYDD	4D9F4
				AXDD	4D9F8	AYDD	4D9FC	BXDD	4DA00	BYDD	4DA04
				DHIGHD	4DA08	DLOWDD	4DA10	MLDD	4DA18	MRDD	4DA1C
				MBDD	4DA20	MTDD	4DA24	WIDEDD	4DA28	HIGHDD	4DA2C
				DDDDYY	4DA30	DXXDYY	4DA34	DDDSDD	4DA38	HOLDDD	4DA3C
				CANVDD	4DA40	YTOPDD	4DA44	YREVDD	4DA48	FRMCNT	4DA54
				SCFL	4DA58	XERRDD	4DA68	YERRDD	4DA6C	VCHXDD	4DA70
				VCHYDD	4DA74	ISPACE	4DA78	IROW	4DA7C	NTRL	4DA80
				RITE2X	4DA84	RITE2Y	4DA88				
IOFRMV= *	4DA90	10EC	1	IOFRMV	4DD78						
FRAMEV= *	4EB80	18A	1	FRAMEV	4EBA0						
EZPLOT= *	4ED10	3008	1								

NAME	ORIGIN	LENGTH	SEG. NO.	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION
				EZPLOT	4F3C8						
ENDJOB= *	51DE8	322	1	ENDJOB	51F60						
IHCLSCN *	52110	17C	1	DCOS	52110	DSIN	5212E				
IHCLTANH*	52290	154	1	DTANH	52290						
IHCFOVER*	523E8	50	1	OVERFL	523E8						
IHCLERF *	52438	328	1	DERFC	52438	DERF	52452				
IHCLTNCT*	52760	188	1	DCOTAN	52760	DTAN	5277C	QDTAN	52894		
IHCLASCN*	528E8	190	1	DARCOS	528E8	DARSIN	52904				
IHCCLABS*	52A78	A6	1	CDABS	52A78						
IHCCLSCN*	52B28	1C0	1	CDCOS	52B28	CDSIN	52B42				
IHCCLSQT*	52CE8	C8	1	CDSQRT	52CE8						
IHCFCDXI*	52DB0	134	1	FCDXI=	52DB0						
IHCCLAS *	52EE8	D8	1	COMPY*	52EE8	CDDVD=	52F04				
IHCFIOSH*	52FC0	D12	1	FIOCS*	52FC0						
IHCUATBL*	536D8	148	1								
IHCFCVTH*	53E20	107C	1	ADCON=	53E20	FCVZO	53F6C	FCVAO	54012	FCVLO	540A2
				FCVIO	543D8	FCVEO	548CA	FCVCO	54ACC	INT6SW	54E81
$PRIVATE *	54EA0	1E8	1	DATE	54EA0						
LINEV= *	55088	4DA	1	LINEV	550D8						
YAXISV= *	55568	1DA	1	YAXISV	555B8						
XAXISV= *	55748	1DA	1	XAXISV	55768						
TABLIV= *	55928	9F8	1	TABLIV	561E0						
RITSTV= *	56320	678	1	RITSTV	563E0	RITE2V	56588				
PRINTV= *	56998	25A	1	PRINTV	56A48						
TYPSET *	56BF0	98	1								
PLOTVI= *	56C88	158	1	PLOTVI	56CA0						
CHSIZV= *	56DE0	124	1	CHSIZV	56DF0						
BRITEV= *	56F08	11E	1	BRITEV	56F20						

NAME		ORIGIN	LENGTH	SEG. NO.	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION
NXV=	*	57028	28A	1	NXV	57080						
NYV=	*	572B8	28A	1	NYV	57310						
BIGV=	*	57548	D6	1	BIGV	57550						
$PRIVATE	*	57620	108	1	SCAN	57620						
SORT=	*	57728	1D4	1	SORT	57748						
SNXYV=	*	57900	124	1	SNXYV	57910						
DXDYV=	*	57A28	884	1	DXDYV	57B20						
SMALLV=	*	582B0	D6	1	SMALLV	582B8						
SETNIV=	*	58388	188	1	SETNIV	583A8						
SETNDV=	*	58510	1B8	1	SETNDV	58530						
POLPLT=	*	586C8	B42	1	POLPLT	58868						
EZGRID=	*	59210	12FA	1	EZGRID	59390						
CAMRAV=	*	5A510	156	1	CAMRAV	5A538						
BNBCDV=	*	5A668	41C	1	BNBCDV	5A6F0						
SHFT1V	*	5AA88	5C	1								
IHGLOG	*	5AAE8	10C	1	ALOG10	5AAE8	ALOG	5AB04				
IHGFRXPI*		5ABF8	94	1	FRXPI*	5ABF8						
HOLLV=	*	5AC90	1D8	1	HOLLV	5ACC0						
SHFT2V	*	5AE68	50	1								
VCHARV=	*	5AEB8	45A	1	VCHARV	5AF40						
XMODV=	*	5B318	124	1	XMODV	5B328						
YMODV=	*	5B440	EE	1	YMODV	5B448						
$PRIVATE	*	5B530	5C	1	MASK	5B530						
PLOTV=	*	5B590	13E	1	PLOTV	5B5A8						
LABLV=	*	5B6D0	712	1	LABLV	5BA58						
POINTV=	*	5BDE8	28C	1	POINTV	5BF58						
POLARV=	*	5C0A8	FDE	1	POLARV	5C610						

NAME		ORIGIN	LENGTH	SEG. NO.	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION
ANUMARG	*	5D088	28	1	NUMARG	5D088						
IHCSSCN	*	5D080	104	1	COS	5D080	SIN	5D0CC				
MSXYV=	*	5D188	140	1	MSXYV	5D1C8						
LINRV=	*	5D2F8	862	1	LINRV	5D308						
YSCALV=	*	5DB60	28C	1	YSCALV	5DBC0						
XSCALV=	*	5DE20	28C	1	XSCALV	5DE80						
STOPTV=	*	5E0E0	E6	1	STOPTV	5E0F0						
SETCOV=	*	5E1C8	140	1	SETCOV	5E1D8						
NONLNV=	*	5E308	658	1	NONLNV	5E360						
HOLDOV=	*	5E960	10C	1	HOLDOV	5E970						
ERRLNV=	*	5EA70	252	1	ERRLNV	5EA88						
ERRNLV=	*	5ECC8	264	1	ERRNLV	5ED08						
SBLDGOR	*	5EF30	84	1	OR	5EF30						
$PRIVATE	*	5EFE8	24	1	ANDV	5EFE8						
CORE=	*	5F010	A8	1	CORE	5F010						
SCERRV=	*	5F0B8	140	1	SCERRV	5F0C8						
ERMRKV=	*	5F1F8	136	1	ERMRKV	5F218						
BCOMD	*	5F330	38	1								
$ENTAB		5F368	78	1								
SR2490=		5F3E0	52E	2	SR2490	5F4F0						
READIT=		5F910	1966	2	READIT	5FE70						
ZPRM=		61278	2E4	2	ZPRM	61300						
ZREADX=		61560	16FC	2	ZREADX	61A80						
ZPRS=		62C60	2524	2	ZPRS	64120						
VIXEN=		5F3F0	8C98	3	VIXEN	66010						
WRITEM=		5F3E0	480	4	WRITEM	5F4C0						
INFCOF=		5F890	940	4								

NAME	ORIGIN	LENGTH	SEG. NO.	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION
				INFCOF	5FAE8						
ADD=	601D0	32C	4	ADD	60268						
INTGRL=	60500	2CE8	4	INTGRL	61AA8						
READY=	68098	46A	5	READY	68118						
DAVDON=	68508	812	5	DAVDON	686F8						
MIMAX=	68098	AE6	6	MIMAX	684C0						
GIMAX=	68880	AE6	6	GIMAX	68FA8						
GRAM=	68098	4E8	7	GRAM	68118						
ROSBRK=	68580	9FC	7	ROSBRK	687E8						

ENTRY ADDRESS 2CE0
TOTAL LENGTH 69666

```
IEF285I   SYSOUT                                         SYSOUT
IEF285I   VOL SER NOS=
IEF285I   SYS1.FORTLIB                                   KEPT
IEF285I   VOL SER NOS= AVC001.
IEF285I   SYS1.DOUBLEP                                   KEPT
IEF285I   VOL SER NOS= AVC001.
IEF285I   SYS68312.T174300.RP002.P2542F.R0000002         DELETED
IEF285I   VOL SER NOS= AVC001.
IEF285I   SYS68312.T174300.RP002.P2542F.GOSET            PASSED
IEF285I   VOL SER NOS= SSSSSS.
//GO EXEC PGM=*.LKED.SYSLMOD,COND=(5,LT,LKED)                        00000080
//SCRATCH DD DSNAME=*.LKED.SYSLMOD,VOLUME=REF=*.LKED.SYSLMOD,       X00000090
//             DISP=(OLD,DELETE)                                     00000100
//FT05F001 DD SYSOUT=A                                               00000110
//GO.SC4020 DD UNIT=TAPE7,LABEL=(,BLP),                              *ASP*
//             VOLUME=(,SER=(SCR280))                              ASP
//GO.FT08F001 DD UNIT=TAPE9,LABEL=(,BLP),VOLUME=SER=EARL
//GO.FT09F001 DD UNIT=SYSSQ,SPACE=(800,(1000,250))
//GO.SYSABEND DD SYSOUT=A
//GO.FT05F001 DD *
IEF236I ALLOC. FOR P2542F   GO
IEF237I PGM=*.DD ON 292
IEF237I SCRATCH  ON 292
IEF237I SC4020   ON 280
IEF237I FT08F001 ON 184
IEF237I FT09F001 ON 291
IEF237I FT05F001 ON 271
```

```
INPUT CARDS READ                                                    17.45. 9.00     11/07/68
DATA*PRESET DATA                                                               PRESE  1*DATA
DATA*      ERNRTB    0.  2.26D-6   1.7D-5  4.26D-5  1.112D-4  .00033           PRESE  2*DATA
DATA*      .001068     .01171    .0804    1000000.                             PRESE  3*DATA
DATA*      ERNUTB    0.   10.    14.  18.   22.    26.   30.   1000000.        PRESE  4*DATA
DATA*      ERNTBL                                                              PRESE  5*DATA
DATA*      (1,01)1    100.   1.15D6 4.0D9  2.1D11 7.D11 1.3D12  2.D12  2.D12   PRESE  6*DATA
DATA*      (1,02)1    100.   1.15D6 4.0D9  2.1D11 7.D11 1.3D12  2.D12  2.D12   PRESE  7*DATA
DATA*      (1,03)1    100.   2.0D06 2.0D10 7.2D11 3.1D12 7.2D12 1.0D13 1.0D13  PRESE  8*DATA
DATA*      (1,04)1    100.   4.3D07 1.0D11 3.5D12 1.5D13 4.0D13 7.0D13 7.0D13  PRESE  9*DATA
DATA*      (1,05)1    100.   6.7D08 7.7D11 2.0D13 8.6D13 2.1D14 3.5D14 3.5D14  PRESE 10*DATA
DATA*      (1,06)1    100.   1.2D10 9.2D12 1.7D14 7.4D14 1.8D15 3.0D15 3.0D15  PRESE 11*DATA
DATA*      (1,07)1    100.   6.0D11 1.1D14 1.9D15 7.0D15 1.8D16 2.8D16 2.8D16  PRESE 12*DATA
DATA*      (1,08)1    100.   2.3D12 8.1D14 1.4D16 5.4D16 1.5D17 2.2D17 2.2D17  PRESE 13*DATA
DATA*      (1,09)1    100.   1.4D13 5.0D15 9.1D16 3.6D17 1.0D18 2.0D18 2.0D18  PRESE 14*DATA
DATA*      (1,10)1    100.   1.4D13 5.0D15 9.1D15 3.6D17 1.0D18 2.0D18 2.0D18  PRESE 15*DATA
DATA*      RSTABL .0 1.E-6 1.E-5  1.E-4  1.E-3  1.E-2  .1 1.      100.         PRESE 16*DATA
DATA*      HSTABL 0. 30.(20.)450.  470.  1.E10                                 PRESE 17*DATA
DATA*      ENTABL                                                              PRESE 18*DATA
DATA* (1,9)1  0.0  0.72E9  0.25E14  0.20E15  0.78E16  0.35E17  0.13E18         PRESE 19*DATA
DATA* 0.34E18  0.62E18  0.90E18  0.14E19  0.17E19  0.21E19  0.25E19  0.36E19   PRESE 20*DATA
DATA* 0.38E19  0.47E19  0.56E19  0.63E19  0.70E19  0.86E19  0.29E19            PRESE 21*DATA
DATA* 0.12E20  0.14E20  0.14E20                                                PRESE 22*DATA
DATA*    (1,8)1  0.                                                            PRESE 23*DATA
DATA*          0.72E7  0.25E12  0.20E13  0.78E14  0.35E15  0.13E16  0.34E16    PRESE 24*DATA
DATA* 0.62E16  0.90E16  0.14E17  0.17E17  0.21E17  0.25E17  0.36E17  0.38E17   PRESE 25*DATA
DATA* 0.47E17  0.56E17  0.63E17  0.70E17  0.86E17  0.20E17  0.12E18            PRESE 26*DATA
DATA* 0.14E18  0.14E18                                                         PRESE 27*DATA
DATA*    (1,7)1  0.                                                            PRESE 28*DATA
DATA*          0.45E7  0.48E11  0.91E12  0.56E13  0.29E14  0.14E15  0.34E15    PRESE 29*DATA
DATA* 0.54E15  0.80E15  0.12E16  0.14E16  0.17E16  0.21E16  0.24E16  0.28E16   PRESE 30*DATA
DATA* 0.33E16  0.42E16  0.46E16  0.57E16  0.72E16  0.83E16  0.94E16            PRESE 31*DATA
DATA* 0.14E17  0.14E17                                                         PRESE 32*DATA
DATA*    (1,6)1  0.                                                            PRESE 33*DATA
DATA*          0.19E7  0.43E10  0.60E11  0.37E12  0.27E13  0.13E14  0.30E14    PRESE 34*DATA
DATA* 0.46E14  0.68E14  0.86E14  0.10E15  0.13E15  0.15E15  0.17E15  0.20E15   PRESE 35*DATA
DATA* 0.26E15  0.28E15  0.34E15  0.38E15  0.52E15  0.62E15  0.72E15  0.10E16   PRESE 36*DATA
DATA* 0.10E16                                                                  PRESE 37*DATA
DATA*    (1,5)1  0.                                                            PRESE 38*DATA
DATA*          0.58E6  0.15E8  0.28E10  0.23E11  0.26E12  0.13E13  0.24E13     PRESE 39*DATA
DATA* 0.35E13  0.50E13  0.62E13  0.76E13  0.94E13  0.10E14  0.12E14            PRESE 40*DATA
DATA* 0.14E14  0.16E14  0.19E14  0.24E14  0.28E14  0.33E14  0.45E14            PRESE 41*DATA
DATA* 0.60E14  0.74E14  0.74E14                                                PRESE 42*DATA
DATA*    (1,4)1  0.                                                            PRESE 43*DATA
DATA*          0.92E5  0.16E8  0.16E9  0.14E10  0.32E11  0.10E12               PRESE 44*DATA
DATA* 0.18E12  0.27E12  0.36E12  0.44E12  0.53E12  0.60E12  0.74E12            PRESE 45*DATA
DATA* 0.89E12  0.97E12  0.11E13  0.13E13  0.15E13  0.23E13  0.26E13  0.35E13   PRESE 46*DATA
DATA* 0.39E13  0.45E13  0.45E13                                                PRESE 47*DATA
DATA*    (1,3)1  0.                                                            PRESE 48*DATA
DATA*          0.52E4  0.94E6  0.60E7  0.12E9  0.31E10  0.82E10  0.14E11       PRESE 49*DATA
DATA* 0.19E11  0.27E11  0.31E11  0.40E11  0.44E11  0.51E11  0.59E11  0.68E11   PRESE 50*DATA
DATA* 0.88E11  0.95E11  0.12E12  0.16E12  0.20E12  0.25E12  0.28E12            PRESE 51*DATA
DATA* 0.42E12  0.42E12                                                         PRESE 52*DATA
DATA*    (1,2)1  0.                                                            PRESE 53*DATA
DATA*          0.80E3  0.42E5  0.32E6  0.25E7  0.32E9  0.71E9  0.11E10         PRESE 54*DATA
DATA* 0.15E10  0.18E10  0.23E10  0.27E10  0.31E10  0.42E10  0.52E10  0.60E10   PRESE 55*DATA
DATA* 0.78E10  0.90E10  0.12E11  0.14E11  0.17E11  0.24E11  0.29E11  0.33E11   PRESE 56*DATA
DATA* 0.33E11                                                                  PRESE 57*DATA
DATA*      (1-30,1)  0.                                                        PRESE 58*DATA
DATA*      FMCTBL  1. 3.(3.)30.  1.E6                                          PRESE 59*DATA
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DATA*      THTTBL   0. 2.(4.)30.  45.  1.E6                                           PRESE 60*DATA
DATA*      ETABL                                                                      PRESE 61*DATA
DATA* (1,1)1  1.0  3.0  6.0  9.0  12.0  15.0  18.0  21.0  24.0  27.0                  PRESE 62*DATA
DATA* 30.0  100.0                                                                     PRESE 63*DATA
DATA* (1,2)1  1.13  3.11  6.30  9.64  13.1  16.8  20.6  24.6  28.8  33.4              PRESE 64*DATA
DATA* 38.0  100.0                                                                     PRESE 65*DATA
DATA* (1,3)1  1.29  3.33  7.00  11.2  16.2  22.0  29.0  37.7  48.6  63.0              PRESE 66*DATA
DATA* 81.0  100.0                                                                     PRESE 67*DATA
DATA* (1,4)1  1.43  3.58  7.84  13.4  21.0  33.4  49.2  80.0  100.0                   PRESE 68*DATA
DATA* 100.0  100.0  100.0                                                             PRESE 69*DATA
DATA* (1,5)1  1.57  3.85  8.89  16.7  29.8  58.0  100.0  100.0  100.0                 PRESE 70*DATA
DATA* 100.0  100.0  100.0                                                             PRESE 71*DATA
DATA* (1,6)1  1.70  4.15  10.2  21.8  51.0  100.0  100.0  100.0  100.0                PRESE 72*DATA
DATA* 100.0  100.0  100.0                                                             PRESE 73*DATA
DATA* (1,7)1  1.84  4.49  12.0  31.6  100.0  100.0  100.0  100.0                      PRESE 74*DATA
DATA* 100.0  100.0  100.0  100.0                                                      PRESE 75*DATA
DATA* (1,8)1  2.00  4.88  14.6  53.0  100.0  100.0  100.0  100.0  100.0               PRESE 76*DATA
DATA* 100.0  100.0  100.0                                                             PRESE 77*DATA
DATA* (1,9)1  2.13  5.32  18.4  100.0  100.0  100.0  100.0  100.0  100.0              PRESE 78*DATA
DATA* 100.0  100.0  100.0                                                             PRESE 79*DATA
DATA* (1,10)1  2.76  7.79  100.0  100.0  100.0  100.0  100.0  100.0  100.0            PRESE 80*DATA
DATA* 100.0  100.0  100.0                                                             PRESE 81*DATA
DATA* (1,11)1  100.0  100.0  100.0  100.0  100.0  100.0  100.0  100.0                 PRESE 82*DATA
DATA* 100.0  100.0  100.0  100.0                                                      PRESE 83*DATA
DATA*      XDTABL   .0000001  .01   .03   .1   1.E6                                   PRESE 84*DATA
DATA*      YDTABL   0.  15.  20.(20.)160.  1.E6                                       PRESE 85*DATA
DATA*      ZDTABL   0.   .01   .1   1.                                                PRESE 86*DATA
DATA*      DTABL                                                                      PRESE 87*DATA
DATA* (1,5,1)1  0.0  0.70E1  0.38E3  0.32E10  0.25E12  0.32E13  0.17E14               PRESE 88*DATA
DATA* 0.84E14  0.24E15  0.44E15  0.44E15                                              PRESE 89*DATA
DATA* (1,4,1)1  0.0  0.50E1  0.38E3  0.32E10  0.25E12  0.32E13  0.17E14               PRESE 90*DATA
DATA* 0.84E14  0.24E15  0.44E15  0.44E15                                              PRESE 91*DATA
DATA* (1,3,1)1  0.0  0.32E2  0.12E4  0.11E10  0.78E11  0.10E13  0.65E13               PRESE 92*DATA
DATA* 0.31E14  0.87E14  0.16E15  0.16E15                                              PRESE 93*DATA
DATA* (1,2,1)1  0.0  0.95E2  0.30E4  0.20E9  0.05E11  0.14E12  0.20E13                PRESE 94*DATA
DATA* 0.78E13  0.22E14  0.38E14  0.38E14                                              PRESE 95*DATA
DATA* (1,1,1)1  0.0  0.90E2  0.30E4  0.20E9  0.05E11  0.14E12  0.20E13                PRESE 96*DATA
DATA* 0.78E13  0.22E14  0.38E14  0.38E14                                              PRESE 97*DATA
DATA* (1,5,2)1  0.0  1.0E5  3.5E7  2.0E11  1.3E12  2.0E12  4.5E12  1.4E13             PRESE 98*DATA
DATA* 2.4E13  3.0E13  4.0E13                                                          PRESE 99*DATA
DATA* (1,4,2)1  0.0  1.0E5  3.5E7  2.0E11  1.3E12  2.0E12  4.5E12  1.4E13             PRESE100*DATA
DATA* 2.4E13  3.0E13  4.0E13                                                          PRESE101*DATA
DATA* (1,3,2)1  0.0  5.5E4  1.9E7  1.1E11  2.3E11  4.5E11  2.0E12  5.0E12             PRESE102*DATA
DATA* 9.0E12  1.5E13  2.5E13                                                          PRESE103*DATA
DATA* (1,2,2)1  0.0  2.0E4  7.0E6  4.0E10  1.6E11  2.0E11  6.0E11  1.4E12             PRESE104*DATA
DATA* 2.0E12  3.0E12  4.0E12                                                          PRESE105*DATA
DATA* (1,1,2)1  0.0  2.0E4  7.0E6  4.0E10  1.6E11  2.0E11  6.0E11  1.4E12             PRESE106*DATA
DATA* 2.0E12  3.0E12  4.0E12                                                          PRESE107*DATA
DATA* (1,5,3)1  0.0  2.4E5  1.5E8  7.6E11  5.6E11  1.3E13  1.6E13  2.1E13             PRESE108*DATA
DATA* 3.0E13  4.0E13  4.5E13                                                          PRESE109*DATA
DATA* (1,4,3)1  0.0  2.4E5  1.5E8  7.6E11  5.6E12  1.3E13  1.6E13  2.1E13             PRESE110*DATA
DATA* 3.0E13  4.0E13  4.5E13                                                          PRESE111*DATA
DATA* (1,3,3)1  0.0  1.2E5  7.1E7  3.7E11  2.4E12  5.8E12  6.2E12  7.7E12             PRESE112*DATA
DATA* 1.1E13  1.5E13  2.0E13                                                          PRESE113*DATA
DATA* (1,2,3)1  0.0  4.5E4  2.7E7  1.4E11  7.1E11  1.7E12  1.7E12  2.0E12             PRESE114*DATA
DATA* 2.7E12  3.5E12  4.0E12                                                          PRESE115*DATA
DATA* (1,1,3)1  0.0  4.5E4  2.7E7  1.0E11  7.1E11  1.7E12  1.7E12  2.0E12             PRESE116*DATA
DATA* 2.7E12  3.5E12  4.0E12                                                          PRESE117*DATA
DATA* (1,5,4)1  0.0  7.9E5  2.3E8  2.0E12  1.8E13  6.0E13  1.4E14  1.3E14             PRESE118*DATA
DATA* 1.2E14  1.5E14  2.0E14                                                          PRESE119*DATA
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ROYAL BUSINESS FORMS INCORPORATED nashua new hampshire

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DATA* (1,4,4)1  0.0  7.9E5  2.3E8  2.0E12  1.8E13  6.0E13  1.4E14  1.3E14    PRESE120*DATA
DATA* 1.2E14  1.5E14  2.0E14                                                  PRESE121*DATA
DATA* (1,3,4)1  0.0  5.2E5  1.5E8  1.3E12  8.0E12  3.0E13  5.7E13  5.2E13    PRESE122*DATA
DATA* 4.7E13  5.0E13  6.0E13                                                  PRESE123*DATA
DATA* (1,2,4)1  0.0  1.7E5  5.0E7  4.3E11  2.5E12  1.1E13  1.5E13  1.3E13    PRESE124*DATA
DATA* 1.2E13  1.3E13  2.0E13                                                  PRESE125*DATA
DATA* (1,1,4)1  0.0  1.7E5  5.0E7  4.3E11  2.5E12  1.1E13  1.5E13  1.3E13    PRESE126*DATA
DATA* 1.2E13  1.3E13  2.0E13                                                  PRESE127*DATA
DATA* CNUMB(1)  0.02  2.0  1.0  0.0  0.5                                      PRESE128*DATA
DATA* CNUMB(59)  0.66  1.2 (64)  0.0  0.0  0.25  0.5                          PRESE129*DATA
DATA* (83)  4.4E26  0.0  1.0  0.0  1.0  0.0  1.0                              PRESE130*DATA
DATA* (90)  1.0  6.3246E14  0.0  1.0 (100)  0.0 (115)  1.0E11                 PRESE131*DATA
DATA* (116)  1000.0  1.0  1.0  1.0E3  0.0  0.0  1.0                           PRESE132*DATA
DATA* (123)  5.0E-12  -1.5  1.0 (130)  1.0  0.0  1.0  0.0  2.0  1.0E-10  0.0 PRESE133*DATA
DATA* (159)  0.66  120.0 (164)  0.04  86.0 (169)  1.0                         PRESE134*DATA
DATA* ACON 1.                                                                 PRESE135*DATA
DATA* AKW  50.                                                                PRESE136*DATA
DATA* BCON 1.                                                                 PRESE137*DATA
DATA* B21 1.                                                                  PRESE138*DATA
DATA* B22 .25                                                                 PRESE139*DATA
DATA* B23 0.0                                                                 PRESE140*DATA
DATA* CCON 1.                                                                 PRESE141*DATA
DATA* CRNOW .75                                                               PRESE142*DATA
DATA*   DELWH .01 DHCHEM 0.0                                                  PRESE143*DATA
DATA* RHOSL .08042                                                            PRESE144*DATA
DATA* RNOW 118.                                                               PRESE145*DATA
DATA* RTO 8.475D5                                                             PRESE146*DATA
DATA* TABL 1500.                                                              PRESE147*DATA
DATA* BZERO  5.8E-21 B2  4.0E-10 B3  2.0 BTWEN  1.0 B24  1.0E-26              PRESE148*DATA
DATA* DX  50.0 NSTML  100 ZMUS  2.0E11 CNE  0.0 DS8  0.0 X2BOD  0.0 X38  0.0 PRESE149*DATA
DATA* IND2  0 IWPRNT  0 IND  0 IWAKE  2 WKALT  500000.0  0.0 IDBL  4          PRESE150*DATA
DATA* BETAZ  22.0  22.0 PHI1 6.0  6.0 PHI2  6.0  6.0 PHI3  6.0  6.0           PRESE151*DATA
DATA* FRQ1  4.35E8 FRQ2  1.375E9 FRQ3  5.4E9 SIGNL1  1.0E-6                   PRESE152*DATA
DATA* SIGNL2  1.0E-6 SIGNL3  1.0E-6 TAU1  1.0 TAU2  0.4 TAU3  0.4             PRESE153*DATA
DATA* WSTALT  180000.0 XCOM(7)  1.0 ICOM(4)  1  1  1 ACOE  1.0 PFD  0.03      PRESE154*DATA
DATA* SRS(1-8)  40.0                                                          PRESE155*DATA
DATA*       IOP(22-90) 0                                                      PRESE156*DATA
DATA*       ICOM(7) 136 135 134 XCOM(8) 1.0                                   PRESE157*DATA
DATA*       IOP(76) = 1                                                       PRESE158*DATA
DATA*H LAST CARD OF THE PRESET INPUT DECK                                           *DATA
DATA* MEMO  1.0 CASE  1.0 DATE  10.07                                         2241   *DATA
DATA*H ADTECH IV EXAMPLE PROBLEMS, REENTRY VEHICLE                            2241   *DATA
DATA* NPRINT  0 ZST  70000.0 ZO  300000.0 GAMFO  -20.0 VO  23000.0            2241   *DATA
DATA* W1  500.0 AN1  1.0 RB1  15.0 THETA1  8.0 MOPT  1 MHEAT  1 NOSEOP  1     2241   *DATA
DATA* MATLN1  3 TN1  4850.0 TASL  2700.0 IDBL  3 IOP(34)  1 (37)  1           2241   *DATA
DATA* WSTALT  160000.0 WKALT  300000.0  0.0 BETAZ  22.0  22.0                 2241   *DATA
DATA* PHI1  7.0  7.0                                                          2241   *DATA
DATA*1                                                                               *DATA
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ADTECH IV EXAMPLE PROBLEMS, REENTRY VEHICLE 2241

CASE 1.001 DATE 10.07 MEMO 1.0 2542F

REFERENCE REENTRY VEHICLE CHARACTERISTICS

W1	THETA1	RN1	RB1	LAMDA1	LA1	W2	THETA2	RN2	RB2
500.00	8.00	1.00	15.00	0.07	100.55	0.0	0.0	0.0	0.0
LAMDA2	LA2	ZTURN	ZON	ZOFF	THO	TON	TOFF	ISP NGEOM	LP
0.0	0.0	-1.00000 00	0.0	0.0	0.0	0.0	0.0	1.00 1	4

ALTITUDE	TIME	VELOCITY	DECELERATION	BETA
300000.0	0.0	23000.00	0.33	175.48
290000.0	1.27	23013.29	0.32	241.59
280000.0	2.54	23026.46	0.32	294.24
270000.0	3.81	23039.45	0.32	351.94
260000.0	5.07	23052.13	0.31	418.89
250000.0	6.33	23064.48	0.30	468.45
240000.0	7.59	23076.41	0.29	660.11
230000.0	8.85	23088.37	0.28	831.57
220000.0	10.11	23099.44	0.27	942.36
210000.0	11.37	23109.74	0.25	1051.57
200000.0	12.62	23119.16	0.22	1159.60
190000.0	13.87	23127.22	0.19	1385.30
180000.0	15.13	23134.26	0.15	1558.50
170000.0	16.37	23139.68	0.09	1673.34
160000.0	17.62	23141.06	-0.01	1773.19
150000.0	18.87	23138.17	-0.15	1862.60
140000.0	20.12	23128.05	-0.38	1943.20
130000.0	21.36	23104.42	-0.74	2011.33
120000.0	22.61	23065.41	-1.48	1895.19
110000.0	23.86	22980.92	-2.81	1730.07
100000.0	25.11	22832.32	-4.64	1733.52
90000.0	26.38	22591.91	-7.37	1756.69
80000.0	27.66	22207.56	-11.59	1770.53
70000.0	28.96	21595.09	-17.96	1773.19

ALTITUDE	TIME	WAKE R1	WAKE R2	WAKE R3	WAKE L1	WAKE L2	WAKE L3
300000.0	0.0	1.00000000 00	0.0	0.0	0.0	0.0	0.0
290000.0	1.27	1.00000000 00	0.0	0.0	0.0	0.0	0.0
280000.0	2.54	1.00000000 00	0.0	0.0	0.0	0.0	0.0
270000.0	3.81	1.00000000 00	0.0	0.0	0.0	0.0	0.0
260000.0	5.07	1.00000000 00	0.0	0.0	0.0	0.0	0.0
250000.0	6.33	1.00000000 00	0.0	0.0	0.0	0.0	0.0
240000.0	7.59	1.00000000 00	0.0	0.0	0.0	0.0	0.0
230000.0	8.85	1.00000000 00	0.0	0.0	0.0	0.0	0.0
220000.0	10.11	1.00000000 00	0.0	0.0	0.0	0.0	0.0
210000.0	11.37	1.00000000 00	0.0	0.0	0.0	0.0	0.0
200000.0	12.62	1.00000000 00	0.0	0.0	0.0	0.0	0.0
190000.0	13.87	1.00000000 00	0.0	0.0	0.0	0.0	0.0
180000.0	15.13	1.00000000 00	0.0	0.0	0.0	0.0	0.0
170000.0	16.37	1.00000000 00	0.0	0.0	0.0	0.0	0.0
160000.0	17.62	2.33045920 00	0.0	0.0	596.15	0.0	0.0
150000.0	18.87	2.33045920 00	0.0	0.0	434.78	0.0	0.0
140000.0	20.12	1.48423710 00	0.0	0.0	298.86	0.0	0.0
130000.0	21.36	-4.40008480-01	0.0	0.0	194.37	0.0	0.0
120000.0	22.61	-6.25768490 01	0.0	0.0	0.0	0.0	0.0
110000.0	23.86	-6.19607000 01	0.0	0.0	0.0	0.0	0.0
100000.0	25.11	-6.19769100 01	0.0	0.0	0.0	0.0	0.0
90000.0	26.38	-6.23432510 01	0.0	0.0	0.0	0.0	0.0
80000.0	27.66	-6.32512910 01	0.0	0.0	0.0	0.0	0.0
70000.0	28.96	-6.53550530 01	0.0	0.0	0.0	0.0	0.0

```
INPUT CARDS READ                                                                  17.45.52.31      11/07/68
DATA* CASE  2.0                                                                             2241-2   *DATA
DATA*H DECOY OPTIMIZATION EXAMPLE                                                           2241-2   *DATA
DATA* IREF  2 IPROG  4 LIMIT  200 LRED  6 WRF  0.8 IN  2    RN1  0.1                                 *DATA
DATA* IDNO  136  138       DELX  0.1  1.0        DVECT  2.5  20.0                           2241-2   *DATA
DATA* NCONS  10                                                                                      *DATA
DATA* IDC  133  3915  3941  3944  136  138        134  137  3965  3962                      2241-2   *DATA
DATA* AMULT  1.0  .00001  .00001  .00001  1.0  1.0  1.0  1.0  0.0  0.0                               *DATA
DATA* CALOW  0.0  0.0  0.0  0.0  1.5  15.0        4.0  0.0  0.0  0.0                                 *DATA
DATA* STP  40.0  0.0  0.0  0.0  4.0  40.0         12.0  0.5  0.0  0.0                                *DATA
DATA* NGEOM  3 W1  40.0 MCP  5 PFD  0.001                                                   2241-2   *DATA
DATA* IOP(1)  0  0  0  1  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  3                2241-2   *DATA
DATA* (28)  1 (34)  1 SRS(1)  1.0 (4)  1.0                                                  2241-2   *DATA
DATA* H  300000.0  200000.0  150000.0  100000.0  70000.0                                    2241-2   *DATA
DATA* IOP(31)  1 (37)  1 SRS(7)  1.0                                                        2241-2   *DATA
DATA* BCV  -30.0  -40.0  -110.0  -170.0  -200.0                                             2241-2   *DATA
DATA* TCV  30.0  40.0  110.0  170.0  200.0                                                           *DATA
DATA* SV  30.0  40.0  110.0  170.0  200.0                                                            *DATA
DATA* BCWL1  -400.0  -400.0  -300.0  -180.0  -100.0                                         2241-2   *DATA
DATA* TCWL1  450.0  400.0  350.0  350.0  200.0                                                       *DATA
DATA* SWL1  400.0  430.0  300.0  180.0  100.0                                               2241-2   *DATA
DATA* SWR1  10.0  10.0  10.0  10.0  10.0                                                    2241-2   *DATA
DATA* BCWR1  -40.0  -40.0  -48.0  -56.0  -60.0                                                       *DATA
DATA* TCWR1  30.0  30.0  38.0  46.0  50.0                                                   2241-2   *DATA
DATA*1                                                                                               *DATA
```

DECOY OPTIMIZATION EXAMPLE 2241-2

CASE 2.001 DATE 10.07 MEMO 1.0 2542F

BASIC DECOY CHARACTERISTICS

W1	THETA1	RN1	RB1	LAMDA1	LA1	W2	THETA2	RN2	RB2
40.00	6.87	0.10	2.50	0.04	20.00	0.0	0.0	0.0	0.0

LAMDA2	LA2	ZTURN	ZON	ZOFF	THU	TON	TOFF	ISP	NGEOM	LP
0.0	0.0	-1.00000 00	0.0	0.0	0.0	0.0	0.0	1.00	3	4

ALTITUDE	TIME	VELOCITY	DECELERATION	BETA
300000.0	0.0	23000.00	0.33	321.88
290000.0	1.27	23013.41	0.33	347.15
280000.0	2.54	23026.71	0.32	404.58
270000.0	3.81	23039.90	0.32	536.82
260000.0	5.07	23052.95	0.32	744.76
250000.0	6.33	23065.86	0.31	869.84
240000.0	7.59	23078.46	0.31	1001.15
230000.0	8.85	23090.74	0.30	1143.82
220000.0	10.11	23102.57	0.29	1298.29
210000.0	11.37	23113.77	0.27	1336.58
200000.0	12.62	23124.05	0.25	1644.24
190000.0	13.87	23134.28	0.26	2425.11
180000.0	15.12	23144.64	0.25	3438.50
170000.0	16.37	23154.33	0.23	3900.85
160000.0	17.62	23163.06	0.20	4384.04
150000.0	18.87	23170.19	0.15	4882.27
140000.0	20.11	23174.91	0.08	5389.31
130000.0	21.35	23176.06	-0.03	5862.37
120000.0	22.60	23171.61	-0.21	6278.10
110000.0	23.84	23158.26	-0.49	6602.09
100000.0	25.08	23130.16	-0.96	6778.48
90000.0	26.32	23078.11	-1.74	6774.29
80000.0	27.57	22985.27	-3.20	6389.24
70000.0	28.82	22798.57	-6.27	5470.61

ALTITUDE	TIME	WAKE R1	WAKE R2	WAKE R3	WAKE L1	WAKE L2	WAKE L3
300000.0	0.0	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
290000.0	1.27	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
280000.0	2.54	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
270000.0	3.81	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
260000.0	5.07	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
250000.0	6.33	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
240000.0	7.59	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
230000.0	8.85	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
220000.0	10.11	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
210000.0	11.37	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
200000.0	12.62	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
190000.0	13.87	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
180000.0	15.12	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
170000.0	16.37	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
160000.0	17.62	-1.39844770 01	0.0	0.0	57.46	0.0	0.0
150000.0	18.87	-1.40786710 01	0.0	0.0	45.63	0.0	0.0
140000.0	20.11	-1.46788910 01	0.0	0.0	73.69	0.0	0.0
130000.0	21.35	-1.57026160 01	0.0	0.0	99.15	0.0	0.0
120000.0	22.60	-1.70998460 01	0.0	0.0	116.22	0.0	0.0
110000.0	23.84	-1.88643240 01	0.0	0.0	128.63	0.0	0.0
100000.0	25.08	-2.09776660 01	0.0	0.0	136.95	0.0	0.0
90000.0	26.32	-2.33238470 01	0.0	0.0	141.72	0.0	0.0
80000.0	27.57	-7.28157000 01	0.0	0.0	0.0	0.0	0.0
70000.0	28.82	-6.96282420 01	0.0	0.0	0.0	0.0	0.0

```
VELOCTY INTEGRAL =    1.53631600 07 LEAVE CORRIDOR AT  1.13269230 05

INTEGRAL OF ( VELOCTY/SIGMA)**2  6.71277340 05

WAKE L1 INTEGRAL =   0.0              LEAVE CORRIDOR AT  0.0

INTEGRAL OF ( WAKE L1/SIGMA)**2  1.07286440 05

WAKE R1 INTEGRAL =   0.0              LEAVE CORRIDOR AT  0.0

INTEGRAL OF ( WAKE R1/SIGMA)**2  8.09744010 05

MISC      W2/W1F     TH2/TH1F    RN2/RN1F    RB2/RB1F    LM2/LM1F    LA2/LA1F    W1/V1     W2/V2
           0.0        0.0         0.0         0.0         0.0         0.0        0.295     0.0

          W2-W1F     TH2-TH1F    RN2-RN1F    RB2-RB1F    LM2-LM1F    LA2-LA1F
           0.0        0.0         0.0         0.0         0.0         0.0

  II   LOWER BOUND      UPPER BOUND      OCCUR(II)        PENALTY
 133   0.0              4.00000000 01    4.00000000 01    0.0
3915   0.0              0.0              1.53631600 07    2.36026680 09
3941   0.0              0.0              0.0              0.0
3944   0.0              0.0              0.0              0.0
 136   1.50000000 00    4.00000000 00    2.50000000 00    0.0
 138   1.60000000 01    4.80000000 01    2.00000000 01    0.0
 134   4.00000000 00    1.20000000 01    6.87477550 00    0.0
 137   0.0              5.00000000-01    4.00000000-02    0.0
3965   0.0              0.0              2.62786720 00    0.0
3962   0.0              0.0              3.21910030-01    0.0
*FEV*  F =   2.36026680 09 X =   2.50000000 00   2.00000000 01

NTRIA      N NSTAG NSUCC                  U
  1        1   0     0**********************
P(I) I = 1 TO  2
          2.5000000000        20.0000000000

IN ROSBRK DP =
1       0.10000000 00        0.0

P(I) I = 1 TO  2
        2.60000000 00        2.00000000 01

IN ROSBRK N =   1  E(N) =      0.10000000000 00
```

CASE 2.002 DATE 10.07 MEMO 1.0 2542F

BASIC DECOY CHARACTERISTICS

W1	THETA1	RN1	RB1	LAMDA1	LA1	W2	THETA2	RN2		RB2
40.00	7.16	0.10	2.60	0.04	20.00	0.0	0.0	0.0		0.0
LAMDA2	**LA2**	**ZTURN**	**ZON**	**ZOFF**	**THO**	**TON**	**TOFF**	**ISP**	**NGEON**	**LP**
0.0	0.0	-1.00000D 00	0.0	0.0	0.0	0.0	0.0	1.00	3	4

ALTITUDE	TIME	VELOCITY	DECELERATION	BETA
300000.0	0.0	23000.00	0.33	298.62
290000.0	1.27	23013.40	0.33	322.11
280000.0	2.54	23026.67	0.32	374.55
270000.0	3.81	23039.82	0.32	494.63
260000.0	5.07	23052.82	0.32	683.12
250000.0	6.33	23065.64	0.31	798.14
240000.0	7.59	23078.17	0.30	919.28
230000.0	8.85	23090.33	0.29	1050.99
220000.0	10.11	23102.00	0.28	1193.70
210000.0	11.37	23112.99	0.26	1229.10
200000.0	12.62	23123.10	0.25	1634.74
190000.0	13.87	23133.31	0.26	2430.47
180000.0	15.12	23143.57	0.25	3128.11
170000.0	16.37	23152.69	0.22	3527.26
160000.0	17.62	23161.00	0.18	3941.87
150000.0	18.87	23167.37	0.13	4364.06
140000.0	20.11	23171.02	0.05	4795.30
130000.0	21.36	23170.56	-0.08	5194.67
120000.0	22.60	23163.71	-0.28	5545.12
110000.0	23.84	23146.68	-0.61	5819.41
100000.0	25.08	23112.83	-1.14	5971.17
90000.0	26.33	23051.88	-2.02	5974.14
80000.0	27.57	22943.94	-3.71	5557.81
70000.0	28.83	22730.48	-7.07	4850.63

ALTITUDE	TIME	WAKE R1	WAKE R2	WAKE R3	WAKE L1	WAKE L2	WAKE L3
300000.0	0.0	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
290000.0	1.27	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
280000.0	2.54	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
270000.0	3.81	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
260000.0	5.07	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
250000.0	6.33	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
240000.0	7.59	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
230000.0	8.85	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
220000.0	10.11	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
210000.0	11.37	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
200000.0	12.62	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
190000.0	13.87	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
180000.0	15.12	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
170000.0	16.37	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
160000.0	17.62	-1.33492660 01	0.0	0.0	62.95	0.0	0.0
150000.0	18.87	-1.34725970 01	0.0	0.0	49.50	0.0	0.0
140000.0	20.11	-1.40800770 01	0.0	0.0	68.65	0.0	0.0
130000.0	21.36	-1.51075940 01	0.0	0.0	93.18	0.0	0.0
120000.0	22.60	-1.65146370 01	0.0	0.0	113.78	0.0	0.0
110000.0	23.84	-1.82972250 01	0.0	0.0	124.85	0.0	0.0
100000.0	25.08	-2.04330450 01	0.0	0.0	135.74	0.0	0.0
90000.0	26.33	-2.28021110 01	0.0	0.0	141.34	0.0	0.0
80000.0	27.57	-7.04609720 01	0.0	0.0	0.0	0.0	0.0
70000.0	28.83	-6.93721280 01	0.0	0.0	0.0	0.0	0.0

```
VELOCTY INTEGRAL =    1.40897870 07 LEAVE CORRIDOR AT  1.11399060 05

INTEGRAL OF ( VELOCTY/SIGMA)**2  5.96575970 05

WAKE L1 INTEGRAL =    0.0            LEAVE CORRIDOR AT  0.0

INTEGRAL OF ( WAKE L1/SIGMA)**2  1.05214700 05

WAKE R1 INTEGRAL =    0.0            LEAVE CORRIDOR AT  0.0

INTEGRAL OF ( WAKE R1/SIGMA)**2  8.17645930 05

MISC     W2/W1F     TH2/TH1F    RN2/RN1F    RB2/RB1F    LM2/LM1F    LA2/LA1F    W1/V1    W2/V2
          0.0        0.0         0.0         0.0         0.0         0.0        0.273    0.0

          W2-W1F     TH2-TH1F    RN2-RN1F    RB2-RB1F    LM2-LM1F    LA2-LA1F
          0.0        0.0         0.0         0.0         0.0         0.0

  II   LOWER BOUND      UPPER BOUND      OCCUR(II)        PENALTY
 133  0.0             4.00000000 01   4.00000000 01   0.0
3815  0.0             0.0             1.40897870 07   1.98522090 09
3941  0.0             0.0             0.0             0.0
3944  0.0             0.0             0.0             0.0
 136  1.50000000 00   4.00000000 00   2.60000000 00   0.0
 138  1.80000000 01   4.80000000 01   2.00000000 01   0.0
 134  4.00000000 00   1.20000000 01   7.15822310 00   0.0
 137  0.0             5.00000000-01   3.84615380-02   0.0
3965  0.0             0.0             2.57026190 00   0.0
3962  0.0             0.0             3.01542350-01   0.0
*FEV*  F =  1.98522090 09 X =  2.60000000 00  2.00000000 01

NTRIA     N NSTAG NSUCC                    U
   2      1    0    1*****************
P(I) I = 1 TO  2
        2.6000000000      20.0000000000

IN ROSBRK OP =
1       0.30000000 00       0.0

P(I) I = 1 TO  2
      2.90000000 00       2.00000000 01

IN ROSBRK N =  1  F(N) =     0.30000000000 00
```

CASE 2.003 DATE 10.07 MEMC 1.0 2542F

BASIC DECOY CHARACTERISTICS

W1	THETA1	RN1	RB1	LAMDA1	LA1	W2	THETA2	RN2		RB2
40.00	9.01	0.10	2.90	0.03	20.00	0.0	0.0	0.0		0.0
LAMDA2	LA2	ZTURN	ZON	ZOFF	THO	TON	TOFF	ISP	NGEOM	LP
0.0	0.0	-1.00000 00	0.0	0.0	0.0	0.0	0.0	1.00	3	4

ALTITUDE	TIME	VELOCITY	DECELERATION	BETA
300000.0	0.0	23000.00	0.33	242.16
290000.0	1.27	23013.35	0.33	261.31
280000.0	2.54	23026.53	0.32	301.29
270000.0	3.81	23039.56	0.32	391.21
260000.0	5.07	23052.39	0.31	531.70
250000.0	6.33	23065.00	0.31	621.85
240000.0	7.59	23077.20	0.30	717.73
230000.0	8.85	23088.94	0.28	822.19
220000.0	10.11	23099.97	0.26	852.22
210000.0	11.37	23110.04	0.25	1111.69
200000.0	12.62	23120.19	0.25	1617.05
190000.0	13.87	23130.40	0.24	2105.37
180000.0	15.12	23139.16	0.22	2371.64
170000.0	16.37	23147.38	0.18	2631.07
160000.0	17.62	23153.57	0.13	2894.98
150000.0	18.87	23157.23	0.05	3160.29
140000.0	20.11	23156.92	-0.07	3425.27
130000.0	21.36	23150.73	-0.25	3669.88
120000.0	22.60	23135.30	-0.54	3883.98
110000.0	23.85	23105.18	-1.02	4052.26
100000.0	25.09	23050.80	-1.78	4148.30
90000.0	26.34	22957.41	-3.02	4159.58
80000.0	27.59	22789.62	-5.69	3687.76
70000.0	28.86	22477.04	-9.89	3434.07

ALTITUDE	TIME	WAKE R1	WAKE R2	WAKE R3	WAKE L1	WAKE L2	WAKE L3
300000.0	0.0	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
290000.0	1.27	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
280000.0	2.54	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
270000.0	3.81	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
260000.0	5.07	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
250000.0	6.33	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
240000.0	7.59	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
230000.0	8.85	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
220000.0	10.11	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
210000.0	11.37	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
200000.0	12.62	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
190000.0	13.87	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
180000.0	15.12	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
170000.0	16.37	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
160000.0	17.62	-1.15904850 01	0.0	0.0	80.01	0.0	0.0
150000.0	18.87	-1.18430200 01	0.0	0.0	62.44	0.0	0.0
140000.0	20.11	-1.25627940 01	0.0	0.0	54.51	0.0	0.0
130000.0	21.36	-1.37144110 01	0.0	0.0	85.25	0.0	0.0
120000.0	22.60	-1.52802960 01	0.0	0.0	108.58	0.0	0.0
110000.0	23.85	-1.72462170 01	0.0	0.0	122.46	0.0	0.0
100000.0	25.09	-1.95248640 01	0.0	0.0	130.58	0.0	0.0
90000.0	26.34	-2.19868040 01	0.0	0.0	140.31	0.0	0.0
80000.0	27.59	-6.64698930 01	0.0	0.0	0.0	0.0	0.0
70000.0	28.36	-6.78547260 01	0.0	0.0	0.0	0.0	0.0

```
VELOCTY INTEGRAL =   9.57063730 06 LEAVE CORRIDOR AT  1.05896070 05

INTEGRAL OF ( VELOCTY/SIGMA)**2  3.59302050 05

 WAKE L1 INTEGRAL =   0.0           LEAVE CORRIDOR AT  0.0

INTEGRAL OF ( WAKE L1/SIGMA)**2  9.80686830 04

 WAKE R1 INTEGRAL =   0.0           LEAVE CORRIDOR AT  0.0

INTEGRAL OF ( WAKE R1/SIGMA)**2  8.22251520 05

MISC      W2/W1F      TH2/TH1F     RN2/RN1F     RB2/RB1F     LM2/LM1F     LA2/LA1F      W1/V1      W2/V2
            0.0          0.0          0.0          0.0          0.0          0.0        0.220      0.0

          W2-W1F      TH2-TH1F     RN2-RN1F     RB2-RB1F     LM2-LM1F     LA2-LA1F
           0.0          0.0          0.0          0.0          0.0          0.0

   II   LOWER BOUND     UPPER BOUND      OCCUR(I2)       PENALTY
  133  0.0             4.00000000 01   4.00000000 01  0.0
 3915  0.0             0.0             9.57063730 06  9.15970980 08
 3941  0.0             0.0             0.0            0.0
 3944  0.0             0.0             0.0            0.0
  136  1.50000000 00   4.00000000 00   2.90000000 00  0.0
  138  1.50000000 01   4.80000000 01   2.00000000 01  0.0
  134  4.00000000 00   1.20000000 01   8.00636120 00  0.0
  137  0.0             5.00000000-01   3.44827590-02  0.0
 3965  0.0             0.0             2.35872320 00  0.0
 3962  0.0             0.0             2.32234340-01  0.0
*FEV*  F =   9.15970980 08 X =   2.90000000 00   2.00000000 01

 NTRIA      N NSTAG NSUCC                  U
     3      1    0       2915970981.4532160000
P(I) I = 1 TO  2
         2.9000000000         20.0000000000

IN ROSBRK OF =
1          0.90000000 00         0.0

P(I) I = 1 TO  2
         3.80000000 00         2.00000000 01

IN ROSBRK N =   1  E(N) =      0.90000000000 00
```

CASE 2.004 DATE 10.07 MEMO 1.0 2542F

BASIC DECOY CHARACTERISTICS

W1	THETA1	RN1	RB1	LAMDA1	LA1	W2	THETA2	RN2		RB2
40.00	10.53	0.10	3.80	0.03	20.00	0.0	0.0	0.0		0.0
LAMDA2	LA2	ZTURN	ZON	ZOFF	THO	TON	TOFF	ISP	NGEOM	LP
0.0	0.0	-1.30000 00	0.0	0.0	0.0	0.0	0.0	1.00	3	4

ALTITUDE	TIME	VELOCITY	DECELERATION	BETA
300000.0	0.0	23000.00	0.32	143.32
290000.0	1.27	23013.16	0.32	154.67
280000.0	2.54	23026.04	0.31	171.56
270000.0	3.81	23038.57	0.30	208.15
260000.0	5.07	23050.65	0.29	266.68
250000.0	6.33	23062.23	0.28	312.91
240000.0	7.59	23073.02	0.26	399.72
230000.0	8.85	23082.78	0.24	477.49
220000.0	10.11	23092.76	0.25	724.27
210000.0	11.37	23102.30	0.22	833.64
200000.0	12.62	23110.41	0.19	927.30
190000.0	13.88	23117.13	0.14	1019.97
180000.0	15.13	23121.45	0.07	1105.50
170000.0	16.38	23122.71	-0.02	1184.89
160000.0	17.63	23119.55	-0.15	1262.87
150000.0	18.88	23109.93	-0.35	1339.62
140000.0	20.13	23090.30	-0.65	1414.95
130000.0	21.37	23055.35	-1.12	1483.70
120000.0	22.62	22996.47	-1.87	1544.06
110000.0	23.88	22899.44	-3.06	1592.26
100000.0	25.14	22740.27	-4.94	1623.75
90000.0	26.41	22462.04	-8.93	1444.80
80000.0	27.69	21985.61	-14.24	1420.23
70000.0	29.02	21235.23	-21.40	1443.17

ALTITUDE	TIME	WAKE R1	WAKE R2	WAKE R3	WAKE L1	WAKE L2	WAKE L3
300000.0	0.0	1.00000000 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
290000.0	1.27	1.00000000 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
280000.0	2.54	1.00000000 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
270000.0	3.81	1.00000000 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
260000.0	5.07	1.00000000 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
250000.0	6.33	1.00000000 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
240000.0	7.59	1.00000000 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
230000.0	8.85	1.00000000 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
220000.0	10.11	1.00000000 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
210000.0	11.37	1.00000000 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
200000.0	12.62	1.00000000 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
190000.0	13.88	1.00000000 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
180000.0	15.13	1.00000000 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
170000.0	16.38	1.00000000 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
160000.0	17.63	-7.11001720 00	0.0	0.0	158.33	0.0	0.0
150000.0	18.88	-7.54113240 00	0.0	0.0	124.26	0.0	0.0
140000.0	20.13	-8.39381710 00	0.0	0.0	92.66	0.0	0.0
130000.0	21.37	-9.71191860 00	0.0	0.0	64.64	0.0	0.0
120000.0	22.62	-1.14873570 01	0.0	0.0	80.34	0.0	0.0
110000.0	23.88	-1.36501530 01	0.0	0.0	95.58	0.0	0.0
100000.0	25.14	-1.61002690 01	0.0	0.0	119.31	0.0	0.0
90000.0	26.41	-6.20199860 01	0.0	0.0	0.0	0.0	0.0
80000.0	27.69	-6.36101260 01	0.0	0.0	0.0	0.0	0.0
70000.0	29.02	-6.54992180 01	0.0	0.0	0.0	0.0	0.0

```
VELOCTY INTEGRAL =    1.0212262D 06 LEAVE CORRIDOR AT  8.3892634D 04

INTEGRAL OF ( VELOCTY/SIGMA)**2  6.7177905D 04

WAKE L1 INTEGRAL =   0.0          LEAVE CORRIDOR AT  0.0

INTEGRAL OF ( WAKE L1/SIGMA)**2  7.1139749D 04

WAKE R1 INTEGRAL =   0.0          LEAVE CORRIDOR AT  0.0

INTEGRAL OF ( WAKE R1/SIGMA)**2  8.9059377D 05

NISC        W2/W1F       TH2/TH1F      RN2/RN1F      RB2/RB1F      LM2/LM1F      LA2/LA1F      W1/V1       W2/V2
              0.0          0.0           0.0           0.0           0.0           0.0         0.129        0.0

            W2-W1F        TH2-TH1F      RN2-RN1F      RB2-RB1F      LM2-LM1F      LA2-LA1F
            0.0           0.0           0.0           0.0           0.0           0.0

   II   LOWER BOUND     UPPER BOUND     OCCUR(II)      PENALTY
  133  0.0             4.00000000D 01  4.00000000D 01  0.0
 3915  0.0             0.0             1.02122620D 06  1.04290300D 07
 3941  0.0             0.0             0.0             0.0
 3944  0.0             0.0             0.0             0.0
  136  1.50000000D 00  4.00000000D 00  3.80000000D 00  0.0
  138  1.50000000D 01  4.80000000D 01  2.00000000D 01  0.0
  134  4.00000000D 00  1.20000000D 01  1.05279470D 01  0.0
  137  0.0             5.00000000D-01  2.63157890D-02  0.0
 3965  0.0             0.0             2.11507160D 00  0.0
 3962  0.0             0.0             1.64740460D-01  0.0
*FEV*  F =  1.04290300 07 X =   3.80000000 00   2.00000000D 01

 NTRIA       N NSTAG NSUCC                U
     4       1     0     3  10429030.4786984500
P(I) I = 1 TO  2
        3.8000000000       20.0000000000

IN ROSBRK OP =
1        0.27000000D 01        0.0

P(I) I = 1 TO  2
        6.50000000 00       2.00000000 01

IN ROSBRK N =  1  E(N) =     0.27000000000 01
```

CASE 2.005 DATE 10.07 MEMO 1.0 2542F

BASIC DECOY CHARACTERISTICS

W1	THETA1	RN1	RB1	LAMDA1	LA1	W2	THETA2	RN2		RB2
40.00	17.82	0.10	6.50	0.02	20.00	0.0	0.0	0.0		0.0
LAMDA2	LA2	ZTURN	ZON	ZOFF	THO	TON	TOFF	ISP	NGEOM	LP
0.0	0.0	-1.0000D 00	0.0	0.0	0.0	0.0	0.0	1.00	3	4

ALTITUDE	TIME	VELOCITY	DECELERATION	BETA
300000.0	0.0	23000.00	0.31	48.30
290000.0	1.27	23012.26	0.29	51.82
280000.0	2.54	23023.60	0.26	51.74
270000.0	3.81	23033.15	0.21	52.66
260000.0	5.07	23039.96	0.12	54.84
250000.0	6.33	23043.06	0.07	71.32
240000.0	7.60	23046.84	0.05	102.27
230000.0	8.86	23047.86	0.02	142.34
220000.0	10.12	23047.26	-0.09	156.63
210000.0	11.38	23039.92	-0.25	165.80
200000.0	12.64	23026.19	-0.47	173.55
190000.0	13.89	23001.29	-0.78	180.46
180000.0	15.15	22961.03	-1.22	186.39
170000.0	16.41	22900.00	-1.84	191.55
160000.0	17.68	22809.19	-2.74	196.27
150000.0	18.95	22672.45	-4.09	200.54
140000.0	20.22	22464.37	-6.17	204.51
130000.0	21.51	22147.10	-9.32	207.82
120000.0	22.83	21646.59	-15.13	195.36
110000.0	24.18	20814.64	-23.38	188.59
100000.0	25.59	19533.05	-32.81	190.93
90000.0	27.13	17663.02	-42.68	192.67
80000.0	28.86	15039.21	-50.14	191.99
70000.0	30.99	11581.89	-49.11	188.74

ALTITUDE	TIME	WAKE R1	WAKE R2	WAKE R3	WAKE L1	WAKE L2	WAKE L3
300000.0	0.0	1.00000000 00	1.0000000D 00	1.00000000 00	0.0	0.0	0.0
290000.0	1.27	1.00000000 00	1.0000000D 00	1.00000000 00	0.0	0.0	0.0
280000.0	2.54	1.0000000D 00	1.0000000D 00	1.00000000 00	0.0	0.0	0.0
270000.0	3.81	1.00000000 00	1.0000000D 00	1.00000000 00	0.0	0.0	0.0
260000.0	5.07	1.0000000D 00	1.0000000D 00	1.00000000 00	0.0	0.0	0.0
250000.0	6.33	1.0000000D 00	1.0000000D 00	1.0000000D 00	0.0	0.0	0.0
240000.0	7.60	1.0000000D 00	1.0000000D 00	1.00000000 00	0.0	0.0	0.0
230000.0	8.86	1.00000000 00	1.0000000D 00	1.00000000 00	0.0	0.0	0.0
220000.0	10.12	1.0000000D 00	1.0000000D 00	1.00000000 00	0.0	0.0	0.0
210000.0	11.38	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
200000.0	12.64	1.00000000 00	1.0000000D 00	1.00000000 00	0.0	0.0	0.0
190000.0	13.89	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
180000.0	15.15	1.00000000 00	1.0000000D 00	1.0000000D 00	0.0	0.0	0.0
170000.0	16.41	1.00000000 00	1.0000000D 00	1.00000000 00	0.0	0.0	0.0
160000.0	17.68	-1.3032782D 00	0.0	0.0	839.74	0.0	0.0
150000.0	18.95	-1.3032782D 00	0.0	0.0	669.51	0.0	0.0
140000.0	20.22	-1.3032782D 00	0.0	0.0	495.71	0.0	0.0
130000.0	21.51	-1.3032782D 00	0.0	0.0	330.11	0.0	0.0
120000.0	22.83	-6.0479494D 01	0.0	0.0	0.0	0.0	0.0
110000.0	24.18	-5.9467587D 01	0.0	0.0	0.93	0.0	0.0
100000.0	25.59	-6.0561262D 01	0.0	0.0	0.0	0.0	0.0
90000.0	27.13	-6.0238953D 01	0.0	0.0	0.0	0.0	0.0
80000.0	28.86	-6.6405597D 01	0.0	0.0	0.0	0.0	0.0
70000.0	30.99	-7.5047599D 01	0.0	0.0	0.0	0.0	0.0

```
VELOCTY INTEGRAL =   2.54379880 08 LEAVE CORRIDOR AT  2.33533750 05

INTEGRAL OF ( VELOCTY/SIGMA)**2  5.39665010 07

WAKE L1 INTEGRAL =    0.0          LEAVE CORRIDOR AT  0.0

INTEGRAL OF ( WAKE L1/SIGMA)**2  3.06107880 04

WAKE R1 INTEGRAL =   0.0           LEAVE CORRIDOR AT  0.0

INTEGRAL OF ( WAKE R1/SIGMA)**2  2.14954670 04

MISC       W2/W1F      TH2/TH1F     RN2/RN1F     RB2/RB1F     LM2/LM1F     LA2/LA1F     W1/V1     W2/V2
           0.0         0.0          0.0          0.0          0.0          0.0          0.045     0.0

           W2-W1F      TH2-TH1F     RN2-RN1F     RB2-RB1F     LM2-LM1F     LA2-LA1F
           0.0         0.0          0.0          0.0          0.0          0.0

  I2   LOWER BOUND     UPPER BOUND     OCCUR(I2)       PENALTY
 133  0.0             4.00000000 01   4.00000000 01   0.0
3915  0.0             0.0             2.54379880 08   6.47091250 11
3941  0.0             0.0             0.0             0.0
3944  0.0             0.0             0.0             0.0
 136  1.50000000 00   4.00000000 00   6.50000000 00   6.25000000 00
 138  1.50000000 01   4.80000000 01   2.00000000 01   0.0
 134  4.00000000 00   1.20000000 01   1.78150650 01   3.38149850 01
 137  0.0             5.00000000-01   1.53846150-02   0.0
3965  0.0             0.0             1.53252570 01   0.0
3962  0.0             0.0             1.00000000 00   0.0
*FEV*  F =  6.47091250 11 X =  6.50000000 00   2.00000000 01

  NTRIA     N NSTAG NSUCC                    U
    5       1    0     3**********************
 P(I) I = 1 TO  2
        6.5000000000       20.0000000000

 IN ROSBRK DP =
 1       0.0                  0.10000000 01

 P(I) I = 1 TO  2
       3.80000000 00      2.10000000 01

 IN ROSBRK N =   2  E(N) =     0.10000000000 01
```

CASE	2.006	DATE	10.07	MEMO	1.0	2542F

BASIC DECOY CHARACTERISTICS

W1	THETA1	RN1	RB1	LAMDA1	LA1	W2	THETA2	RN2	RB2
40.00	10.04	0.10	3.80	0.03	21.00	0.0	0.0	0.0	0.0
LAMDA2	LA2	ZTURN	ZON	ZOFF	THO	TON	TOFF	ISP	NGEOM LP
0.0	0.0	-1.0000D 00	0.0	0.0	0.0	0.0	0.0	1.00	3 4

ALTITUDE	TIME	VELOCITY	DECELERATION	BETA
300000.0	0.0	23000.00	0.32	143.89
290000.0	1.27	23013.16	0.32	155.37
280000.0	2.54	23026.05	0.31	175.51
270000.0	3.81	23038.61	0.30	217.70
260000.0	5.07	23050.78	0.29	281.93
250000.0	6.33	23062.48	0.28	330.08
240000.0	7.59	23073.41	0.26	383.08
230000.0	8.85	23083.49	0.24	441.16
220000.0	10.11	23092.26	0.19	457.92
210000.0	11.37	23099.52	0.17	591.00
200000.0	12.62	23106.21	0.16	774.87
190000.0	13.88	23112.11	0.13	995.39
180000.0	15.13	23116.85	0.09	1187.04
170000.0	16.38	23119.05	0.01	1278.73
160000.0	17.63	23116.91	-0.11	1369.63
150000.0	18.88	23109.18	-0.29	1459.16
140000.0	20.13	23092.32	-0.57	1547.67
130000.0	21.37	23061.69	-0.99	1629.25
120000.0	22.62	23009.42	-1.66	1701.20
110000.0	23.88	22922.80	-2.74	1760.02
100000.0	25.13	22780.12	-4.44	1799.05
90000.0	26.40	22534.14	-8.03	1610.06
80000.0	27.68	22101.20	-13.13	1553.39
70000.0	29.00	21411.09	-19.89	1576.28

ALTITUDE	TIME	WAKE R1	WAKE R2	WAKE R3	WAKE L1	WAKE L2	WAKE L3
300000.0	0.0	1.00000000 00	1.0000000D 00	1.0000000D 00	0.0	0.0	0.0
290000.0	1.27	1.00000000 00	1.0000000D 00	1.0000000D 00	0.0	0.0	0.0
280000.0	2.54	1.00000000 00	1.0000000D 00	1.0000000D 00	0.0	0.0	0.0
270000.0	3.81	1.00000000 00	1.0000000D 00	1.0000000D 00	0.0	0.0	0.0
260000.0	5.07	1.00000000 00	1.0000000D 00	1.0000000D 00	0.0	0.0	0.0
250000.0	6.33	1.00000000 00	1.0000000D 00	1.0000000D 00	0.0	0.0	0.0
240000.0	7.59	1.00000000 00	1.0000000D 00	1.0000000D 00	0.0	0.0	0.0
230000.0	8.85	1.00000000 00	1.0000000D 00	1.0000000D 00	0.0	0.0	0.0
220000.0	10.11	1.00000000 00	1.0000000D 00	1.0000000D 00	0.0	0.0	0.0
210000.0	11.37	1.00000000 00	1.0000000D 00	1.0000000D 00	0.0	0.0	0.0
200000.0	12.62	1.00000000 00	1.0000000D 00	1.0000000D 00	0.0	0.0	0.0
190000.0	13.88	1.00000000 00	1.0000000D 00	1.0000000D 00	0.0	0.0	0.0
180000.0	15.13	1.00000000 00	1.0000000D 00	1.0000000D 00	0.0	0.0	0.0
170000.0	16.38	1.00000000 00	1.0000000D 00	1.0000000D 00	0.0	0.0	0.0
160000.0	17.63	-7.51656330 00	0.0	0.0	144.16	0.0	0.0
150000.0	18.88	-7.95803750 00	0.0	0.0	112.63	0.0	0.0
140000.0	20.13	-8.82259040 00	0.0	0.0	83.59	0.0	0.0
130000.0	21.37	-1.01475140 01	0.0	0.0	60.37	0.0	0.0
120000.0	22.62	-1.19253430 01	0.0	0.0	86.10	0.0	0.0
110000.0	23.88	-1.40897650 01	0.0	0.0	106.36	0.0	0.0
100000.0	25.13	-1.65335650 01	0.0	0.0	122.45	0.0	0.0
90000.0	26.40	-6.34048220 01	0.0	0.0	0.0	0.0	0.0
80000.0	27.68	-6.49264310 01	0.0	0.0	0.0	0.0	0.0
70000.0	29.00	-6.67699080 01	0.0	0.0	0.0	0.0	0.0

```
VELOCTY INTEGRAL =   0.0          LEAVE CORRIDOR AT  0.0

INTEGRAL OF ( VELOCTY/SIGMA)**2  2.7796143D 04

WAKE L1 INTEGRAL =   0.0          LEAVE CORRIDOR AT  0.0

INTEGRAL OF ( WAKE L1/SIGMA)**2  7.6165828D 04

WAKE R1 INTEGRAL =   0.0          LEAVE CORRIDOR AT  0.0

INTEGRAL OF ( WAKE R1/SIGMA)**2  8.7926589D 05

MISC        W2/W1F      TH2/TH1F     RN2/RN1F     RB2/RB1F     LM2/LM1F     LA2/LA1F     W1/V1     W2/V2
             0.0         0.0          0.0          0.0          0.0          0.0         0.123      0.0

            W2-W1F      TH2-TH1F     RN2-RN1F     RB2-RB1F     LM2-LM1F     LA2-LA1F
             0.0         0.0          0.0          0.0          0.0          0.0

   IZ    LOWER BOUND      UPPER BOUND      OCCUR(I2)        PENALTY
  133  0.0             4.00000000 01   4.00000000 01   0.0
 3915  0.0             0.0             0.0             0.0
 3941  0.0             0.0             0.0             0.0
 3944  0.0             0.0             0.0             0.0
  136  1.50000000D 00  4.00000000 00   3.80000000 00   0.0
  138  1.50000000 01   4.80000000 01   2.10000000 01   0.0
  134  4.00000000 00   1.20000000 01   1.0035125D 01   0.0
  137  0.0             5.00000000-01   2.6315789D-02   0.0
 3965  0.0             0.0             2.0675840D 00   0.0
 3942  0.0             0.0             1.5323727D-01   0.0
*FEV*  F =   0.0          X =   3.80000000 00   2.10000000 01
```

```
CASE     2.026     DATE   10.07     NEMO     1.0     2542F

                              TRANSLATIONAL QUANTITIES

TIME=   0.0    Z=   0.3000000 06   V=  0.23000000 05   GAMF= -0.2000D 02   XR=    0.0              BETA=   0.1033D 03
               ZTR= 0.8738710 05   QD=     0.1223D 01  MINF=  0.2571D 02   VDOTOG= 0.3210D 00      BETAP=  0.3444D-03
               TH=     0.0         TXT=    0.0         YR=    0.0          PSIALP= 0.0             D/W=    0.1184D-01

                                   DRAG QUANTITIES

               CD=     0.8873D 00  CDP=    0.3830D-01  CDFINF(BL, LAM,WB)=  0.0                    CDB=    0.0
                                   CDPO=   0.3830D-01  CDFINF(BL, LAM,NB)=  0.0                    CDI=    0.0
                                   XBAR=   0.4268D 02  REYINFLA=            0.7852D 03             XBAR1=  0.5783D 00
                                              LAMINAR CDI COMPONENTS
                                   CDI/P=  0.0         CDI/SF=              0.0                    CDI/TC= 0.0

                                   CONFIGURATION

               RN=     0.1000D 00  THETA=  0.7707D 01  LA=     0.2300D 02  LAMBDA= 0.3125D-01      AREF=   0.2234D 00
               W=      0.2048D 02  DELW=   0.0         WABL=   0.0         WTHRST= 0.0

                                   MASS LOSS

          QDOT(STAG)= 0.0                 QDOT(SONIC)= 0.0              MSRTO= 0.3148D 03       PSPO=   0.1066D-02
      S STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
          TANG. PT.    X/LA=0.2    X/LA=0.4    X/LA=0.6    X/LA=0.75   X/LA=0.9    X/LA=1.0    CONE R=RB
PEPSO=    0.0          0.0         0.0         0.0         0.0         0.0         0.0         0.0
QDOT=     0.0          0.0         0.0         0.0         0.0         0.0         0.0         0.0
MDOT=     0.0          0.0         0.0         0.0         0.0         0.0         0.0         0.0
Q INT=    0.0          0.0         0.0         0.0         0.0         0.0         0.0         0.0
          Q INT(STAG)=  0.0                                Q INT(SONIC)=  0.0      TURBULENT ONLY

                         TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0

                              TRANSLATIONAL QUANTITIES

TIME=   1.27   Z=   0.2900000 06   V=  0.2301298D 05   GAMF= -0.2002D 02   XR=    0.2707850 05     BETA=   0.1116D 03
               ZTR= 0.8738710 05   QD=     0.2109D 01  MINF=  0.2603D 02   VDOTOG= 0.3139D 00      BETAP=  0.8300D-03
               TH=     0.0         TXT=    0.0         YR=    0.0          PSIALP= 0.0             D/W=    0.1961D-01

                                   DRAG QUANTITIES

               CD=     0.8213D 00  CDP=    0.3829D-01  CDFINF(BL, LAM,WB)=  0.0                    CDB=    0.0
                                   CDPO=   0.3829D-01  CDFINF(BL, LAM,NB)=  0.0                    CDI=    0.0
                                   XBAR=   0.3208D 02  REYINFLA=            0.1434D 04             XBAR1=  0.4326D 00
                                              LAMINAR CDI COMPONENTS
                                   CDI/P=  0.0         CDI/SF=              0.0                    CDI/TC= 0.0

                                   CONFIGURATION

               RN=     0.1000D 00  THETA=  0.7707D 01  LA=     0.2300D 02  LAMBDA= 0.3125D-01      AREF=   0.2234D 00
               W=      0.2048D 02  DELW=   0.0         WABL=   0.0         WTHRST= 0.0
```

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                                        MASS LOSS

      QDOT(STAG)= 0.0              QDOT(SONIC)= 0.0            HSRTO= 0.31510 03       PSPO=   0.19090-02
   X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
            TANG. PT.    X/LA=0.2    X/LA=0.4    X/LA=0.6    X/LA=0.75   X/LA=0.9    X/LA=1.0    CONE R=RB
   PEPSB=   0.0          0.0         0.0         0.0         0.0         0.0         0.0         0.0
   QDOT =   0.0          0.0         0.0         0.0         0.0         0.0         0.0         0.0
   MDOT =   0.0          0.0         0.0         0.0         0.0         0.0         0.0         0.0
   Q INT=   0.0          0.0         0.0         0.0         0.0         0.0         0.0         0.0
            Q INT(STAG)=  0.0                                Q INT(SONIC)=  0.0       TURBULENT ONLY

                         TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0

                                 TRANSLATIONAL QUANTITIES

 TIME=   2.54   Z=    0.2800000 06   V=  0.2302563D 05   GAMF= -0.20040 02   XR=    0.5414210 05   BETA=   0.13460 03
                ZTR= 0.8738710 05    QD=      0.38400 01   MINF=   0.26050 02   VDOTOG= 0.30560 00     BETAP=-0.23010-02
                TH=       0.0        TXT=    0.0         YR=       0.0         PSIALP= 0.0            D/W=    0.28520-01

                                   DRAG QUANTITIES

                CD=     0.68090 00   CDP=    0.38290-01  CDFINF(BL, LAM,WB)=  0.0                  CDB=    0.0
                                     CDPV=   0.38290-01  CDFINF(BL, LAM,NB)=  0.0                  CDI=    0.0
                                     XBAR=   0.24240 02  REYINFLA=            0.25140 04           XBAR1= 0.32690 00
                                           LAMINAR CDI COMPONENTS
                                     CDI/P= 0.0          CDI/SF=              0.0                  CDI/TC= 0.0

                                     CONFIGURATION

                RN=     0.10000 00   THETA= 0.77070 01   LA=     0.23000 02   LAMBDA= 0.31250-01   AREF=   0.22340 00
                W=      0.20480 02   DELW=  0.0          WABL=   0.0          WTHRST= 0.0

                                        MASS LOSS

      QDOT(STAG)= 0.0              QDOT(SONIC)= 0.0            HSRTO= 0.31550 03       PSPO=   0.33480-02
   X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
            TANG. PT.    X/LA=0.2    X/LA=0.4    X/LA=0.6    X/LA=0.75   X/LA=0.9    X/LA=1.0    CONE R=RB
   PEPSB=   0.0          0.0         0.0         0.0         0.0         0.0         0.0         0.0
   QDOT=    0.0          0.0         0.0         0.0         0.0         0.0         0.0         0.0
   MDOT =   0.0          0.0         0.0         0.0         0.0         0.0         0.0         0.0
   Q INT=   0.0          0.0         0.0         0.0         0.0         0.0         0.0         0.0
            Q INT(STAG)=  0.0                                Q INT(SONIC)=  0.0       TURBULENT ONLY

                         TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0

                                 TRANSLATIONAL QUANTITIES

 TIME=   3.81   Z=   0.2700000 06    V=  0.2303789D 05   GAMF= -0.20060 02   XR=    0.8119090 05   BETA=   0.17850 03
                ZTR= 0.8738710 05    QD=      0.67400 01   MINF=   0.26060 02   VDOTOG= 0.29700 00     BETAP=-0.43840-02
                TH=       0.0        TXT=    0.0         YR=       0.0         PSIALP= 0.0            D/W=    0.37770-01

                                   DRAG QUANTITIES

                CD=     0.51360 00   CDP=    0.38290-01  CDFINF(BL, LAM,WB)=  0.0                  CDB=    0.0
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                    CDPO=  0.38290-01   CDFINF(BL, LAM,NB)=  0.0                CDI=    0.0
                    XBAR=  0.18320 02   REYINFLA=            0.44110 04         XBAR1=  0.24700 00
                                   LAMINAR CDI COMPONENTS
                    CDI/P= 0.0          CDI/SF=              0.0                CDI/TC= 0.0

                                           CONFIGURATION

              RN=     0.10000 00   THETA= 0.77070 01   LA=    0.23000 02   LAMBDA= 0.31250-01   AREF=  0.22340 00
              W=      0.20480 02   DELW=  0.0          WABL=  0.0          WTHRST= 0.0

                                            MASS LOSS

        QDOT(STAG)= 0.0               QDOT(SONIC)= 0.0              HSRTO= 0.31580 03      PSPO=  0.58770-02
      X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
             TANG. PT.    X/LA=0.2     X/LA=0.4     X/LA=0.6     X/LA=0.75    X/LA=0.9     X/LA=1.0     CONE R=RB
      PEPSB=  0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
      QDOT=   0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
      MDOT=   0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
      Q INT=  0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
             Q INT(STAG)=  0.0                                   Q INT(SONIC)=  0.0      TURBULENT ONLY

                         TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0


                                    TRANSLATIONAL QUANTITIES

   TIME=    5.07   Z=   0.2600000 06   V=  0.23049790 05   GAMF= -0.20080 02   XR=    0.1082250 06   BETA=   0.23780 03
                   ZTR= 0.8738710 05   QD=     0.11640 02  MINF=  0.25870 02   VDOTDG= 0.28640 00   BETAP= -0.59340-02
                   TH=     0.0         TXT=   0.0          YR=    0.0          PSIALP= 0.0          D/W=    0.48920-01

                                         DRAG QUANTITIES

              CD=     0.38540 00   CDP=   0.38300-01   CDFINF(BL, LAM,NB)=  0.0                CDB=    0.0
                                   CDPO=  0.38300-01   CDFINF(BL, LAM,NB)=  0.0                CDI=    0.0
                                   XBAR=  0.13910 02   REYINFLA=            0.75050 04         XBAR1=  0.18810 00
                                                  LAMINAR CDI COMPONENTS
                                   CDI/P= 0.0          CDI/SF=              0.0                CDI/TC= 0.0

                                           CONFIGURATION

              RN=     0.10000 00   THETA= 0.77070 01   LA=    0.23000 02   LAMBDA= 0.31250-01   AREF=  0.22340 00
              W=      0.20480 02   DELW=  0.0          WABL=  0.0          WTHRST= 0.0

                                            MASS LOSS

        QDOT(STAG)= 0.0               QDOT(SONIC)= 0.0              HSRTO= 0.31620 03      PSPO=  0.10150-01
      X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
             TANG. PT.    X/LA=0.2     X/LA=0.4     X/LA=0.6     X/LA=0.75    X/LA=0.9     X/LA=1.0     CONE R=RB
      PEPSB=  0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
      QDOT=   0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
      MDOT=   0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
      Q INT=  0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
             Q INT(STAG)=  0.0                                   Q INT(SONIC)=  0.0      TURBULENT ONLY

                         TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0
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                               TRANSLATIONAL QUANTITIES
TIME=   6.33   Z=   0.2500000D 06   V=  0.2300111D 05   GANF= -0.2009D 02   XR=     0.1352450D 06   BETA=  0.2767D 03
               ZTR= 0.8738710D 05   QD=     0.1870D 02   MINF=  0.2508D 02   VDOTOG= 0.2683D 00     BETAP=-0.3883D-02
               TH=      0.0         TXT=    0.0          YR=    0.0          PSIALP= 0.0            D/W=   0.6761D-01
                               DRAG QUANTITIES
               CD=    0.3314D 00    CDP=   0.3832D-01   CDFINF(BL, LAM,WB)=  0.0                    CDB=   0.0
                                    CDPO=  0.3832D-01   CDFINF(BL, LAM,NB)=  0.0                    CDI=   0.0
                                    XBAR=  0.1085D 02   REYINFLA=            0.1142D 05             XBAR1= 0.1485D 00
                                          LAMINAR CDI COMPONENTS
                                    CDI/P= 0.0          CDI/SF=              0.0                    CDI/TC= 0.0
                                  CONFIGURATION
               RN=    0.1000D 00    THETA= 0.7707D 01   LA=    0.2300D 02   LAMBDA= 0.3125D-01     AREF=  0.2234D 00
               W=     0.2048D 02    DELW=  0.0          WABL=  0.0          WTHRST= 0.0
                                    MASS LOSS
          QDOT(STAG)= 0.0                 QDOT(SONIC)= 0.0              HSRTO= 0.3166D 03        PSPO=  0.1631D-01
     X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
          TANG. PT.   X/LA=0.2   X/LA=0.4   X/LA=0.6   X/LA=0.75   X/LA=0.9   X/LA=1.0   CONE R=RB
PERSB=    0.0         0.0        0.0        0.0        0.0         0.0        0.0        0.0
QDOT=     0.0         0.0        0.0        0.0        0.0         0.0        0.0        0.0
MDOT=     0.0         0.0        0.0        0.0        0.0         0.0        0.0        0.0
Q INT=    0.0         0.0        0.0        0.0        0.0         0.0        0.0        0.0
          Q INT(STAG)=  0.0                      Q INT(SONIC)=  0.0            TURBULENT ONLY
                     TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0

                               TRANSLATIONAL QUANTITIES
TIME=   7.59   Z=   0.2400000D 06   V=  0.2307150D 05   GANF= -0.2011D 02   XR=     0.1622500D 06   BETA=  0.3191D 03
               ZTR= 0.8738710D 05   QD=     0.2924D 02   MINF=  0.2436D 02   VDOTOG= 0.2449D 00     BETAP=-0.4246D-02
               TH=      0.0         TXT=    0.0          YR=    0.0          PSIALP= 0.0            D/W=   0.9164D-01
                               DRAG QUANTITIES
               CD=    0.2873D 00    CDP=   0.3834D-01   CDFINF(BL, LAM,WB)=  0.0                    CDB=   0.0
                                    CDPO=  0.3834D-01   CDFINF(BL, LAM,NB)=  0.0                    CDI=   0.0
                                    XBAR=  0.8586D 01   REYINFLA=            0.1696D 05             XBAR1= 0.1188D 00
                                          LAMINAR CDI COMPONENTS
                                    CDI/P= 0.0          CDI/SF=              0.0                    CDI/TC= 0.0
                                  CONFIGURATION
               RN=    0.1000D 00    THETA= 0.7707D 01   LA=    0.2300D 02   LAMBDA= 0.3125D-01     AREF=  0.2234D 00
               W=     0.2048D 02    DELW=  0.0          WABL=  0.0          WTHRST= 0.0
                                    MASS LOSS
          QDOT(STAG)= 0.0                 QDOT(SONIC)= 0.0              HSRTO= 0.3171D 03        PSPO=  0.2550D-01
     X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
          TANG. PT.   X/LA=0.2   X/LA=0.4   X/LA=0.6   X/LA=0.75   X/LA=0.9   X/LA=1.0   CONE R=RB
```

```
PEPSB=    0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0
QDOT=     0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0
MDOT=     0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0
Q INT=    0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0
          Q INT(STAG)=  0.0                          Q INT(SONIC)=  0.0     TURBULENT ONLY

                    TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0

                              TRANSLATIONAL QUANTITIES

 TIME=   8.85   Z=   0.2300000D 06   V=  0.2308086D 05   GAMF= -0.2013D 02   XR=    0.1892410 06   BETA=  0.3654D 03
                ZTR= 0.8738710 05    QD=      0.4461D 02  MINF=  0.2370D 02   VDOTOG= 0.2151D 00   BETAP=-0.4624D-02
                TH=    0.0           TXT=   0.0           YR=    0.0          PSIALP= 0.0          D/W=   0.1221D 00

                              DRAG QUANTITIES

                CD=     0.2509D 00   CDP=   0.3836D-01   CDFINF(BL, LAM,WB)=  0.0            CDB=   0.0
                                     CDPO=  0.3836D-01   CDFINF(BL, LAM,NB)=  0.0            CDI=   0.0
                                     XBAR=  0.6877D 01   REYINFLA=           0.2468D 05      XBARI= 0.9626D-01
                                            LAMINAR CDI COMPONENTS
                                     CDI/P= 0.0          CDI/SF=             0.0             CDI/TC= 0.0

                              CONFIGURATION

                RN=     0.1000D 00   THETA= 0.7707D 01   LA=    0.2300D 02   LAMBDA= 0.3125D-01   AREF=  0.2234D 00
                W=      0.2048D 02   DELW=  0.0          WABL=  0.0          WTHRST= 0.0

                              MASS LOSS

          QDOT(STAG)= 0.0             QDOT(SONIC)= 0.0              HSRTO= 0.3175D 03       PSPO=  0.3890D-01
 X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
          TANG. PT.   X/LA=0.2   X/LA=0.4   X/LA=0.6   X/LA=0.75   X/LA=0.9   X/LA=1.0   CONE R=RB
PEPSB=    0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0
QDOT=     0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0
MDOT=     0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0
Q INT=    0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0
          Q INT(STAG)=  0.0                          Q INT(SONIC)=  0.0     TURBULENT ONLY

                    TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0

                              TRANSLATIONAL QUANTITIES

 TIME=  10.11   Z=   0.2200000D 06   V=  0.2308883D 05   GAMF= -0.2015D 02   XR=    0.2162170 06   BETA=  0.4155D 03
                ZTR= 0.8738710 05    QD=      0.6657D 02  MINF=  0.2389D 02   VDOTOG= 0.1776D 00   BETAP=-0.5018D-02
                TH=    0.0           TXT=   0.0           YR=    0.0          PSIALP= 0.0          D/W=   0.1602D 00

                              DRAG QUANTITIES

                CD=     0.2206D 00   CDP=   0.3838D-01   CDFINF(BL, LAM,WB)=  0.0            CDB=   0.0
                                     CDPO=  0.3838D-01   CDFINF(BL, LAM,NB)=  0.0            CDI=   0.0
                                     XBAR=  0.5571D 01   REYINFLA=           0.3523D 05      XBARI= 0.7884D-01
                                            LAMINAR CDI COMPONENTS
                                     CDI/P= 0.0          CDI/SF=             0.0             CDI/TC= 0.0
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                                                  CONFIGURATION

              RN=      0.10000 00    THETA= 0.77070 01    LA=      0.23000 02    LAMBDA= 0.31250-01    AREF=  0.22340 00
              W=       0.20480 02    DELW=  0.0           WABL=  0.0             WTHRST= 0.0

                                                    MASS LOSS

          QDOT(STAG)= 0.0                  QDOT(SONIC)= 0.0                 HSRTO= 0.3178D 03        PSPO=  0.58050-01
      X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
              TANG. PT.      X/LA=0.2      X/LA=0.4      X/LA=0.6      X/LA=0.75     X/LA=0.9      X/LA=1.0      CONE  R=RB
      PEPSB=  0.0            0.0           0.0           0.0           0.0           0.0           0.0           0.0
      QDOT=   0.0            0.0           0.0           0.0           0.0           0.0           0.0           0.0
      MDOT=   0.0            0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Q INT=  0.0            0.0           0.0           0.0           0.0           0.0           0.0           0.0
              Q INT(STAG)=   0.0                                Q INT(SONIC)=   0.0            TURBULENT ONLY

                                 TABULAR INPUT ANGLE OF ATTACK ALPHA =   0.0

                                             TRANSLATIONAL QUANTITIES

    TIME=  11.37    Z=     0.2100000 06   V=  0.23095110 05   GAMF= -0.2017D 02   XR=     0.243180D 06   BETA=  0.46980 03
                    ZTR= 0.8738710 05     QD=      0.9738D 02   MINF=  0.2252D 02   VDOTOG= 0.1311D 00    BETAP=-0.54290-02
                    TH=     0.0           TXT=  0.0           YR=    0.0           PSIALP= 0.0           D/W=   0.20730 00

                                                DRAG QUANTITIES

              CD=     0.1951D 00     CDP=   0.3.400D-01   CDFINF(BL, LAM,WB)=  0.0                      CDB=   0.0
                                     CDPO=  0.38400-01    CDFINF(BL, LAM,NB)=  0.0                      CDI=   0.0
                                     XBAR=  0.45580 01    REYINFLA=            0.49450 05               XBARI= 0.65210-01
                                             LAMINAR CDI COMPONENTS
                                     CDI/P= 0.0           CDI/SF=              0.0                      CDI/TC= 0.0

                                                  CONFIGURATION

              RN=      0.10000 00    THETA= 0.77070 01    LA=      0.23000 02    LAMBDA= 0.31250-01    AREF=  0.22340 00
              W=       0.20480 02    DELW=  0.0           WABL=  0.0             WTHRST= 0.0

                                                    MASS LOSS

          QDOT(STAG)= 0.0                  QDOT(SONIC)= 0.0                 HSRTO= 0.3182D 03        PSPO=  0.84920-01
      X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
              TANG. PT.      X/LA=0.2      X/LA=0.4      X/LA=0.6      X/LA=0.75     X/LA=0.9      X/LA=1.0      CONE  R=RB
      PEPSB=  0.0            0.0           0.0           0.0           0.0           0.0           0.0           0.0
      QDOT=   0.0            0.0           0.0           0.0           0.0           0.0           0.0           0.0
      MDOT=   0.0            0.0           0.0           0.0           0.0           0.0           0.0           0.0
      Q INT=  0.0            0.0           0.0           0.0           0.0           0.0           0.0           0.0
              Q INT(STAG)=   0.0                                Q INT(SONIC)=   0.0            TURBULENT ONLY

                                 TABULAR INPUT ANGLE OF ATTACK ALPHA =   0.0

                                             TRANSLATIONAL QUANTITIES

    TIME=  12.62    Z=     0.2000000 06   V=  0.23098900 05   GAMF= -0.2019D 02   XR=     0.270128D 06   BETA=  0.48200 03
                    ZTR= 0.8738710 05     QD=      0.1406D 03   MINF=  0.2204D 02   VDOTOG= 0.4734D-01    BETAP=-0.12200-02
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        TH=      0.0           TXT=     0.0           YR=      0.0            PSIALP= 0.0            D/W=    0.2917D 00

                                                   DRAG QUANTITIES

        CD=      0.1902D 00    CDP=     0.3842D-01    CDFINF(BL, LAM,WB)=   0.4720D-01            CDB=     0.1160D-02
                               CDPO=    0.3842D-01    CDFINF(BL, LAM,NB)=   0.8653D-01            CDI=     0.2716D-01
                               XBAR=    0.4343D 01    REYINFLA=             0.6894D 05            XBAR1=   0.6275D-01
                                              LAMINAR CDI COMPONENTS
                               CDI/P=   0.1436D-01    CDI/SF=               0.5985D-02            CDI/TC=  0.6816D-02

                                                   CONFIGURATION

        RN=      0.1000D 00    THETA=   0.7707D 01    LA=      0.2300D 02   LAMBDA= 0.3125D-01    AREF=    0.2234D 00
        W=       0.2048D 02    DELW=    0.0           WABL=    0.0          WTHRST= 0.0

                                                   MASS LOSS

        QDOT(STAG)= 0.1979D 04        QDOT(SONIC)= 0.0                  HSRTO= 0.3184D 03      PSPO=   0.1226D 00
   X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
             TANG. PT.     X/LA=0.2      X/LA=0.4      X/LA=0.6      X/LA=0.75     X/LA=0.9      X/LA=1.0      CONE R=RB
   PEPSB=    0.6990D-01    0.1933D-01    0.2265D-01    0.2265D-01    0.2265D-01    0.2265D-01    0.2265D-01    0.2265D-01
   QDOT=     0.4424D 03    0.4922D 02    0.3767D 02    0.3076D 02    0.2751D 02    0.2511D 02    0.2383D 02    0.2383D 02
   MDOT=     0.3856D-01    0.3635D-02    0.2697D-02    0.2097D-02    0.1800D-02    0.1575D-02    0.1451D-02    0.0
   Q INT=    0.2776D 03    0.3089D 02    0.2364D 02    0.1930D 02    0.1727D 02    0.1576D 02    0.1495D 02    0.1495D 02
             Q INT(STAG)=  0.1242D 04                               Q INT(SONIC)=  0.0          TURBULENT ONLY

                                    TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0

                                              TRANSLATIONAL QUANTITIES

   TIME=  13.88   Z=   0.1900000 06    V=  0.23099967D 05   GAMF= -0.2030D 02   XR=    0.2970620D 06   BETA=   0.6132D 03
                  ZTR= 0.8737900 05    QD=      0.2045D 03  MINF=   0.2179D 02   VDOTOG= 0.6113D-02     BETAP=-0.1311D-01
                  TH=      0.0         TXT=     0.0         YR=     0.0          PSIALP= 0.0            D/W=    0.3335D 00

                                                   DRAG QUANTITIES

        CD=      0.1495D 00    CDP=     0.3843D-01    CDFINF(BL, LAM,WB)=   0.3771D-01            CDB=     0.1315D-02
                               CDPO=    0.3843D-01    CDFINF(BL, LAM,NB)=   0.7189D-01            CDI=     0.1932D-01
                               XBAR=    0.3584D 01    REYINFLA=             0.9833D 05            XBAR1=   0.5206D-01
                                              LAMINAR CDI COMPONENTS
                               CDI/P=   0.1110D-01    CDI/SF=               0.3843D-02            CDI/TC=  0.4384D-02

                                                   CONFIGURATION

        RN=      0.1033D 00    THETA=   0.7707D 01    LA=      0.2298D 02   LAMBDA= 0.3227D-01    AREF=    0.2234D 00
        W=       0.2048D 02    DELW=    0.3542D-02    WABL=    0.3542D-02   WTHRST= 0.0

                                                   MASS LOSS

        QDOT(STAG)= 0.2348D 04        QDOT(SONIC)= 0.0                  HSRTO= 0.3185D 03      PSPO=   0.1784D 00
   X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
             TANG. PT.     X/LA=0.2      X/LA=0.4      X/LA=0.6      X/LA=0.75     X/LA=0.9      X/LA=1.0      CONE R=RB
   PEPSB=    0.6990D-01    0.1899D-01    0.2269D-01    0.2269D-01    0.2269D-01    0.2269D-01    0.2269D-01    0.2269D-01
   QDOT=     0.5251D 03    0.5889D 02    0.4547D 02    0.3711D 02    0.3319D 02    0.3029D 02    0.2874D 02    0.2874D 02
   MDOT=     0.4713D-01    0.4387D-02    0.3337D-02    0.2650D-02    0.2312D-02    0.2055D-02    0.1913D-02    0.1913D-02
   Q INT=    0.8843D 03    0.9867D 02    0.7577D 02    0.6186D 02    0.5532D 02    0.5050D 02    0.4791D 02    0.4791D 02
             Q INT(STAG)=  0.3955D 04                               Q INT(SONIC)=  0.0          TURBULENT ONLY
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                               TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0

                                         TRANSLATIONAL QUANTITIES

      TIME=  15.13   Z=   0.1800000 06   V=  0.2309932D 05   GAMF= -0.2022D 02   XR=   0.323982D 06   BETA=   0.8096D 03
                     ZTR= 0.873616D 05   QD=      0.2950D 03   MINF=  0.2154D 02   VDOTOG=-0.2412D-01   BETAP=-0.1964D-01
                     TH=      0.0        TXT=   0.0            YR=    0.0          PSIALP= 0.0          D/W=    0.3644D 00

                                            DRAG QUANTITIES

                     CD=      0.1132D 00   CDP=   0.3843D-01   CDFINF(BL, LAM,NB)=   0.3061D-01        CDB=    0.1692D-02
                                           CDPO=  0.3843D-01   CDFINF(BL, LAM,NB)=   0.5980D-01        CDI=    0.1531D-01
                                           XBAR=  0.2971D 01   REYINFLA=             0.1390D 06        XBAR1=  0.4338D-01
                                                          LAMINAR CDI COMPONENTS
                                           CDI/P= 0.9461D-02   CDI/SF=               0.2728D-02        CDI/TC= 0.3118D-02

                                              CONFIGURATION

                     RN=      0.1102D 00   THETA= 0.7707D 01   LA=    0.2293D 02   LAMBDA= 0.3445D-01   AREF=   0.2234D 00
                     W=       0.2047D 02   DELW=  0.1187D-01   WABL=  0.1187D-01   WTHRST= 0.0

                                                MASS LOSS

                 QDOT(STAG)= 0.2730D 04        QDOT(SONIC)= 0.0                HSRTD= 0.3186D 03        PSPO=   0.2573D 00
          X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
                 TANG. PT.     X/LA=0.2     X/LA=0.4     X/LA=0.6     X/LA=0.75    X/LA=0.9     X/LA=1.0     CONE R=RB
          PERSB=   0.6991D-01   0.1826D-01   0.2274D-01   0.2274D-01   0.2274D-01   0.2274D-01   0.2274D-01   0.2274D-01
          QDOT =   0.6104D 03   0.6948D 02   0.5462D 02   0.4455D 02   0.3982D 02   0.3634D 02   0.3447D 02   0.3447D 02
          MDOT =   0.5628D-01   0.5206D-02   0.4057D-02   0.3263D-02   0.2877D-02   0.2584D-02   0.2424D-02   0.2424D-02
          Q INT=   0.1596D 04   0.1791D 03   0.1385D 03   0.1130D 03   0.1011D 03   0.9225D 02   0.8751D 02   0.8751D 02
                 Q INT(STAG)=  0.7136D 04                             Q INT(SONIC)=  0.0        TURBULENT ONLY

                               TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0

                                         TRANSLATIONAL QUANTITIES

      TIME=  16.38   Z=   0.170000D 06   V=  0.2309762D 05   GAMF= -0.2024D 02   XR=   0.350889D 06   BETA=   0.1050D 04
                     ZTR= 0.873399D 05   QD=      0.4242D 03   MINF=  0.2135D 02   VDOTOG=-0.6315D-01   BETAP=-0.2492D-01
                     TH=      0.0        TXT=   0.0            YR=    0.0          PSIALP= 0.0          D/W=    0.4040D 00

                                            DRAG QUANTITIES

                     CD=      0.8723D-01   CDP=   0.3844D-01   CDFINF(BL, LAM,WB)=   0.2511D-01        CDB=    0.1665D-02
                                           CDPO=  0.3844D-01   CDFINF(BL, LAM,NB)=   0.4972D-01        CDI=    0.1213D-01
                                           XBAR=  0.2469D 01   REYINFLA=             0.1966D 06        XBAR1=  0.3622D-01
                                                          LAMINAR CDI COMPONENTS
                                           CDI/P= 0.7996D-02   CDI/SF=               0.1923D-02        CDI/TC= 0.2201D-02

                                              CONFIGURATION

                     RN=      0.1190D 00   THETA= 0.7707D 01   LA=    0.2288D 02   LAMBDA= 0.3718D-01   AREF=   0.2234D 00
                     W=       0.2046D 02   DELW=  0.2238D-01   WABL=  0.2238D-01   WTHRST= 0.0
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                                          MASS LOSS

            QDOT(STAG)= 0.3150D 04      QDOT(SONIC)= 0.0             HSRTO= 0.3186D 03       PSPO=  0.3699D 00
  X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
            TANG. PT.     X/LA=0.2     X/LA=0.4     X/LA=0.6     X/LA=0.75     X/LA=0.9     X/LA=1.0     CONE R=RB
  PEPSB=    0.6991D-01   0.1746D-01   0.2277D-01   0.2277D-01   0.2277D-01   0.2277D-01   0.2277D-01   0.2277D-01
  QDOT=     0.7044D 03   0.8163D 02   0.6548D 02   0.5334D 02   0.4767D 02   0.4349D 02   0.4124D 02   0.4124D 02
  MDOT=     0.6673D-01   0.4173D-02   0.4896D-02   0.3968D-02   0.3513D-02   0.3178D-02   0.2996D-02   0.2996D-02
  Q INT=    0.2419D 04   0.2737D 03   0.2136D 03   0.1743D 03   0.1558D 03   0.1422D 03   0.1349D 03   0.1349D 03
            Q INT(STAG)=  0.1082D 05                        Q INT(SONIC)=  0.0          TURBULENT ONLY

                           TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0


                                    TRANSLATIONAL QUANTITIES

TIME=  17.63   Z=   0.160000D 06   V=  0.2309394D 05   GAMF= -0.2026D 02   XR=    0.377781D 06   BETA=   0.1303D 04
               ZTR= 0.872135D 06   QD=      0.6192D 03  MINF=   0.2134D 02   VDOTOG=-0.1337D 00   BETAP=-0.2532D-01
               TH=     0.0         TXT=   0.0          YR=     0.0          PSIALP= 0.0          D/W=    0.4752D 00

                                       DRAG QUANTITIES

               CD=     0.7023D-01   CDP=   0.3846D-01   CDFINF(BL, LAM,WB)=  0.2048D-01          CDB=    0.1789D-02
                                   CDPO=  0.3846D-01   CDFINF(BL, LAM,HB)=  0.4084D-01          CDI=    0.9501D-02
                                   XBAR=  0.2046D 01   REYINFLA=             0.2862D 06          XBAR1=  0.3001D-01
                                      LAMINAR CDI COMPONENTS
                                   CDI/P= 0.6659D-02   CDI/SF=               0.1325D-02          CDI/TC= 0.1517D-02

                                        CONFIGURATION

               RN=     0.1296D 00   THETA= 0.7707D 01   LA=    0.2281D 02   LAMBDA= 0.4050D-01   AREF=   0.2234D 00
               W=      0.2044D-02   DELW=  0.3506D-01   WABL=  0.3506D-01   WTHRST= 0.0

                                          MASS LOSS

            QDOT(STAG)= 0.3446D 04      QDOT(SONIC)= 0.0             HSRTO= 0.3185D 03       PSPO=  0.5401D 00
  X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
            TANG. PT.     X/LA=0.2     X/LA=0.4     X/LA=0.6     X/LA=0.75     X/LA=0.9     X/LA=1.0     CONE R=RB
  PEPSB=    0.6991D-01   0.1661D-01   0.2277D-01   0.2277D-01   0.2277D-01   0.2277D-01   0.2277D-01   0.2277D-01
  QDOT=     0.8153D 03   0.9643D 02   0.7899D 02   0.6427D 02   0.5740D 02   0.5235D 02   0.4964D 02   0.4964D 02
  MDOT=     0.7946D-01   0.7432D-02   0.5958D-02   0.4802D-02   0.4272D-02   0.3881D-02   0.3668D-02   0.3668D-02
  Q INT=    0.3369D 04   0.3850D 03   0.3040D 03   0.2478D 03   0.2215D 03   0.2022D 03   0.1917D 03   0.1917D 03
            Q INT(STAG)=  0.1507D 05                        Q INT(SONIC)=  0.0          TURBULENT ONLY

                           TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0


                                    TRANSLATIONAL QUANTITIES

TIME=  18.88   Z=   0.150000D 06   V=  0.2308510D 05   GAMF= -0.2028D 02   XR=    0.404659D 06   BETA=   0.1423D 04
               ZTR= 0.872827D 05   QD=      0.9208D 03  MINF=   0.2151D 02   VDOTOG=-0.3052D 00   BETAP=-0.1195D-01
               TH=     0.0         TXT=   0.0          YR=     0.0          PSIALP= 0.0          D/W=    0.6473D 00

                                       DRAG QUANTITIES

               CD=     0.6429D-01   CDP=   0.3851D-01   CDFINF(BL, LAM,WB)=  0.1694D-01          CDB=    0.1858D-02
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                    CDPO=  0.3851D-01   CDFINF(BL, LAM,NB)=  0.3307D-01          CDI=    0.7378D-02
                    XBAR=  0.1686D-01   REYINFLA=            0.4299D 06          XBAR1=  0.2443D-01
                          LAMINAR CDI COMPONENTS
                    CDI/P= 0.5467D-02   CDI/SF=              0.8918D-03          CDI/TC= 0.1019D-02

                                  CONFIGURATION

          RN=     0.1420D 00   THETA= 0.7707D 01   LA=    0.2273D 02   LAMBDA= 0.4436D-01   AREF=  0.2234D 00
          W=      0.2043D 02   DELW=  0.5038D-01   WABL=  0.5038D-01   WTHRST= 0.0

                                    MASS LOSS

     QDOT(STAG)= 0.4244D 04       QDOT(SONIC)= 0.0                HSRTO= 0.3182D 03      PSPO=   0.8031D 00
X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
           TANG. PT.     X/LA=0.2      X/LA=0.4      X/LA=0.6      X/LA=0.75     X/LA=0.9      X/LA=1.0      CONE R=RB
PERSB=     0.6991D-01    0.1579D-01    0.2274D-01    0.2274D-01    0.2274D-01    0.2274D-01    0.2274D-01    0.2274D-01
QDOT=      0.9491D 03    0.1149D 03    0.9602D 02    0.7801D 02    0.6964D 02    0.6348D 02    0.6019D 02    0.6019D 02
MDOT=      0.8537D-01    0.9188D-02    0.7396D-02    0.5880D-02    0.5218D-02    0.4742D-02    0.4487D-02    0.4487D-02
Q INT=     0.4472D 04    0.5171D 03    0.4134D 03    0.3368D 03    0.3009D 03    0.2746D 03    0.2604D 03    0.2604D 03
           Q INT(STAG)=  0.2000D 05                          Q INT(SONIC)=  0.0       TURBULENT ONLY

                    TABULAR INPUT ANGLE OF ATTACK ALPHA =   0.0


                              TRANSLATIONAL QUANTITIES

   TIME=  20.13   Z=    0.1400000D 06   V=  0.73068120 05   GAMF= -0.2030D 02   XR=    0.431522D 06   BETA=  0.1542D 04
                  ZTR=  0.8724460D 05   QD=     0.1405D 04  MINF=  0.2185D 02   VDOTOG=-0.5686D 00    BETAP=-0.1195D-01
                  TH=      0.0          TXT=    0.0         YR=    0.0          PSIALP= 0.0           D/W=   0.9114D 00

                                  DRAG QUANTITIES

          CD=     0.5925D-01   CDP=   0.3859D-01   CDFINF(BL, LAM,WB)=  0.1311D-01          CDB=    0.1877D-02
                               CDPO=  0.3859D-01   CDFINF(BL, LAM,NB)=  0.2626D-01          CDI=    0.5672D-02
                               XBAR=  0.1376D 01   REYINFLA=            0.6709D 06          XBAR1=  0.1995D-01
                                     LAMINAR CDI COMPONENTS
                               CDI/P= 0.4424D-02   CDI/SF=              0.5833D-03          CDI/TC= 0.6652D-03

                                  CONFIGURATION

          RN=     0.1565D 00   THETA= 0.7707D 01   LA=    0.2264D 02   LAMBDA= 0.4891D-01   AREF=  0.2234D 00
          W=      0.2041D 02   DELW=  0.6938D-01   WABL=  0.6938D-01   WTHRST= 0.0

                                    MASS LOSS

     QDOT(STAG)= 0.4986D 04       QDOT(SONIC)= 0.0                HSRTO= 0.3176D 03      PSPO=   0.1226D 01
X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
           TANG. PT.     X/LA=0.2      X/LA=0.4      X/LA=0.6      X/LA=0.75     X/LA=0.9      X/LA=1.0      CONE R=RB
PEPSB=     0.6990D-01    0.1503D-01    0.2198D-01    0.2268D-01    0.2268D-01    0.2268D-01    0.2268D-01    0.2268D-01
QDOT=      0.1115D 04    0.1388D 03    0.1162D 03    0.9575D 02    0.8541D 02    0.7783D 02    0.7377D 02    0.7377D 02
MDOT=      0.1158D 00    0.1181D-01    0.9322D-02    0.7372D-02    0.6484D-02    0.5865D-02    0.5542D-02    0.5542D-02
Q INT=     0.5761D 04    0.6756D 03    0.5460D 03    0.4453D 03    0.3978D 03    0.3629D 03    0.3441D 03    0.3441D 03
           Q INT(STAG)=  0.2576D 05                          Q INT(SONIC)=  0.0       TURBULENT ONLY

                    TABULAR INPUT ANGLE OF ATTACK ALPHA =   0.0
```

TRANSLATIONAL QUANTITIES

TIME= 21.38 Z= 0.1300000 06 V= 0.2303790D 05 GAMF= -0.2032D 02 XR= 0.458371D 06 BETA= 0.1653D 04
ZTR= 0.872041D 05 QD= 0.2174D 04 MINF= 0.2218D 02 VDOTOG=-0.9719D 00 BETAP=-0.1106D-01
TH= 0.0 TXT= 0.0 YR= 0.0 PSIALP= 0.0 D/W= 0.1335D 01

DRAG QUANTITIES

CD= 0.5522D-01 CDP= 0.3874D-01 CDFINF(BL, LAM,WB)= 0.1022D-01 CDB= 0.1884D-02
CDPO= 0.3874D-01 CDFINF(BL, LAM,NB)= 0.2060D-01 CDI= 0.4372D-02
XBAR= 0.1114D 01 REYINFLA= 0.1062D 07 XBARI= 0.1605D-01
LAMINAR CDI COMPONENTS
CDI/P= 0.3566D-03 CDI/SF= 0.3772D-03 CDI/TC= 0.4283D-03

CONFIGURATION

RN= 0.1736D 00 THETA= 0.7707D 01 LA= 0.2253D 02 LAMBDA= 0.5424D-01 AREF= 0.2234D 00
W= 0.2039D 02 DELW= 0.9292D-01 WABL= 0.9292D-01 WTHRST= 0.0

MASS LOSS

QDOT(STAG)= 0.5871D 04 QDOT(SONIC)= 0.0 HSRTO= 0.3167D 03 PSPO= 0.1896D 01
X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH

	TANG. PT.	X/LA=0.2	X/LA=0.4	X/LA=0.6	X/LA=0.75	X/LA=0.9	X/LA=1.0	CONE R=RB
PEPEB=	0.6980D-01	0.1442D-01	0.2036D-01	0.2263D-01	0.2263D-01	0.2263D-01	0.2263D-01	0.2263D-01
QDOT=	0.1313D 04	0.1695D 03	0.1384D 03	0.1181D 0?	0.1053D 03	0.9588D 02	0.9085D 02	0.9085D 02
MDOT=	0.1408D 00	0.1568D-01	0.1177D-01	0.9518D-02	0.8245D-02	0.7383D-02	0.6944D-02	0.6944D-02
Q INT=	0.7278D 04	0.8683D 03	0.7052D 03	0.5790D 03	0.5170D 03	0.4714D 03	0.4470D 03	0.4470D 03

Q INT(STAG)= 0.3255D 05 Q INT(SONIC)= 0.0 TURBULENT ONLY

TABULAR INPUT ANGLE OF ATTACK ALPHA = 0.0

TRANSLATIONAL QUANTITIES

TIME= 22.63 Z= 0.1200000 06 V= 0.2298740D 05 GAMF= -0.2034D 02 XR= 0.485205D 06 BETA= 0.1751D 04
ZTR= 0.871540D 05 QD= 0.3408D 04 MINF= 0.2252D 02 VDOTOG=-0.1603D 01 BETAP=-0.9805D-02
TH= 0.0 TXT= 0.0 YR= 0.0 PSIALP= 0.0 D/W= 0.1947D 01

DRAG QUANTITIES

CD= 0.5205D-01 CDP= 0.3900D-01 CDFINF(BL, LAM,WB)= 0.7777D-02 CDB= 0.1881D-02
CDPO= 0.3900D-01 CDFINF(BL, LAM,NB)= 0.1592D-01 CDI= 0.3396D-02
XBAR= 0.8951D 00 REYINFLA= 0.1706D 07 XBARI= 0.1281D-01
LAMINAR CDI COMPONENTS
CDI/P= 0.2879D-02 CDI/SF= 0.2424D-03 CDI/TC= 0.2752D-03

CONFIGURATION

RN= 0.1937D 00 THETA= 0.7707D 01 LA= 0.2239D 02 LAMBDA= 0.6054D-01 AREF= 0.2234D 00
W= 0.2036D 02 DELW= 0.1232D 00 WABL= 0.1232D 00 WTHRST= 0.0

MASS LOSS

QDOT(STAG)= 0.6926D 04 QDOT(SONIC)= 0.0 HSRTO= 0.3152D 03 PSPO= 0.2972D 01
X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH

	TANG. PT.	X/LA=0.2	X/LA=0.4	X/LA=0.6	X/LA=0.75	X/LA=0.9	X/LA=1.0	CONE R=RB

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PEPSB=    0.6989D-01   0.1400D-01   0.1881D-01   0.2258D-01   0.2258D-01   0.2258D-01   0.2258D-01   0.2258D-01
QDOT=     0.1648D 04   0.2095D 03   0.1666D 03   0.1444D 03   0.1303D 03   0.1186D 03   0.1124D 03   0.1124D 03
MDOT=     0.1713D 00   0.2093D-01   0.1517D-01   0.1272D-01   0.1084D-01   0.9571D-02   0.8934D-02   0.8934D-02
Q INT=    0.9068D 04   0.1105D 04   0.8953D 03   0.7444D 03   0.6643D 03   0.6056D 03   0.5741D 03   0.5741D 03
          Q INT(STAG)=  0.4055D 05                              Q INT(SONIC)=  0.0         TURBULENT ONLY

                          TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0


                                    TRANSLATIONAL QUANTITIES

TIME=   23.89   Z=   0.1100000 06   V=  0.2290485D 05   GAMF= -0.2036D 02   XR=    0.512024D 06   BETA=  0.1830D 04
                ZTR= 0.870945D 05   QD=     0.5419D 04  MINF=  0.2284D 02   VDDTOG=-0.2616D 01    BETAP=-0.7980D-02
                TH=     0.0         TXT=    0.0         YR=     0.0         PSIALP= 0.0           D/W=    0.2961D 01

                                        DRAG QUANTITIES

                CD=    0.4969D-01   CDP=    0.3940D-01  CDFINF(BL, LAM,WB)=  0.5735D-02            CDB=    0.1881D-02
                                    CDPO=   0.3940D-01  CDFINF(BL, LAM,NB)=  0.1210D-01            CDI=    0.2668D-02
                                    XBAR=   0.7128D 00  REYINFLA=            0.2784D 07            XBAR1=  0.1013D-01
                                          LAMINAR CDI COMPONENTS
                                    CDI/P=  0.2337D-02  CDI/SF=              0.1552D-03            CDI/TC= 0.1759D-03

                                          CONFIGURATION

                RN=    0.2176D 00   THETA=  0.7707D 01  LA=    0.2224D 02   LAMBDA= 0.6801D-01    AREF=   0.2234D 00
                W=     0.2032D 02   DELW=   0.1624D 00  WABL=  0.1624D 00   WTHRST= 0.0

                                            MASS LOSS

          QDOT(STAG)= 0.8177D 04      QDOT(SONIC)= 0.0                      HSRTO= 0.3128D 03      PSPO=  0.4726D 01
     X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
          TANG. PT.    X/LA=0.2     X/LA=0.4     X/LA=0.6     X/LA=0.75    X/LA=0.9     X/LA=1.0     CONE R=RB
PEPSB=    0.6988D-01   0.1384D-01   0.1738D-01   0.2256D-01   0.2253D-01   0.2253D-01   0.2253D-01   0.2253D-01
QDOT=     0.1828D 04   0.2630D 03   0.1988D 03   0.1822D 03   0.1619D 03   0.1473D 03   0.1394D 03   0.1394D 03
MDOT=     0.2075D 00   0.2115D-01   0.1957D-01   0.1738D-01   0.1469D-01   0.1283D-01   0.1189D-01   0.1189D-01
Q INT=    0.1118D 05   0.1401D 04   0.1124D 04   0.9503D 03   0.8475D 03   0.7722D 03   0.7318D 03   0.7318D 03
          Q INT(STAG)=  0.5002D 05                              Q INT(SONIC)=  0.0         TURBULENT ONLY

                          TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0


                                    TRANSLATIONAL QUANTITIES

TIME=   25.14   Z=   0.1000000 06   V=  0.2277007D 05   GAMF= -0.2038D 02   XR=    0.538826D 06   BETA=  0.1881D 04
                ZTR= 0.870240D 05   QD=     0.8602D 04  MINF=  0.2298D 02   VDDTOG=-0.4228D 01    BETAP=-0.5064D-02
                TH=     0.0         TXT=    0.0         YR=     0.0         PSIALP= 0.0           D/W=    0.4573D 01

                                        DRAG QUANTITIES

                CD=    0.4823D-01   CDP=    0.4003D-01  CDFINF(BL, LAM,WB)=  0.4161D-02            CDB=    0.1913D-02
                                    CDPO=   0.4003D-01  CDFINF(BL, LAM,NB)=  0.9120D-02            CDI=    0.2122D-02
                                    XBAR=   0.5643D 00  REYINFLA=            0.4496D 07            XBAR1=  0.8003D-02
                                          LAMINAR CDI COMPONENTS
                                    CDI/P=  0.1909D-02  CDI/SF=              0.9985D-04            CDI/TC= 0.1131D-03
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                                        CONFIGURATION

          RN=     0.24600 00   THETA= 0.77070 01   LA=     0.22060 02   LAMBDA= 0.76870-01   AREF=  0.22340 00
          W=      0.20270 02   DELW=  0.21250 00   WABL=   0.21250 00   WTHRST= 0.0

                                         MASS LOSS

          QDOT(STAG)= 0.95680 04        QDOT(SONIC)= 0.0              HSRTO= 0.30910 03       PSPO=  0.75010 01
  X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
          TANG. PT.     X/LA=0.2      X/LA=0.4      X/LA=0.6      X/LA=0.75     X/LA=0.9      X/LA=1.0      CONE R=RB
  PEPSB=  0.69880-01    0.14050-01    0.16140-01    0.20650-01    0.22510-01    0.22510-01    0.22510-01    0.22510-01
  QDOT=   0.21390 04    0.33370 03    0.23800 03    0.21570 03    0.20000 03    0.18170 03    0.17200 03    0.17200 03
  MDOT=   0.24700 00    0.27810-01    0.23920-01    0.21670-01    0.19740-01    0.17320-01    0.16020-01    0.16020-01
  Q INT=  0.13680 05    0.17770 04    0.13980 04    0.12010 04    0.10750 04    0.97900 03    0.92770 03    0.92770 03
          Q INT(STAG)=  0.61170 05                                Q INT(SONIC)=  0.0          TURBULENT ONLY

                         TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0


                                  TRANSLATIONAL QUANTITIES

  TIME=  26.41   Z=   0.9000000 05   V=  0.22551580 05   GAMF= -0.20400 02   XR=   0.5656110 06   BETA=  0.18960 04
                 ZTR= 0.8694090 05   QD=     0.13510 05   MINF=  0.22910 02   VDOTOG=-0.67810 01   BETAP=-0.15270-02
                 TH=     0.0         TXT=   0.0           YR=    0.0          PSIALP= 0.0          D/W=   0.71270-01

                                      DRAG QUANTITIES

                 CD=   0.47700-01    CDP=   0.40980-01   CDFINF(BL, LAM,WB)=  0.30410-02         CDB=   0.19980-02
                                     CDPO=  0.40980-01   CDFINF(BL, LAM,NB)=  0.68260-02         CDI=   0.16770-02
                                     XBAR=  0.44520 00   REYINFLA=            0.71400 07         XBARI= 0.63210-02
                                           LAMINAR CDI COMPONENTS
                                     CDI/P= 0.15410-02   CDI/SF=              0.63510-04         CDI/TC= 0.71930-04

                                       CONFIGURATION

          RN=     0.27940 00   THETA= 0.77070 01   LA=     0.21840 02   LAMBDA= 0.87310-01   AREF=  0.22340 00
          W=      0.20210 02   DELW=  0.27360 00   WABL=   0.27360 00   WTHRST= 0.0

                                         MASS LOSS

          QDOT(STAG)= 0.11020 05        QDOT(SONIC)= 0.0              HSRTO= 0.30330 03       PSPO=  0.11790 02
  X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
          TANG. PT.     X/LA=0.2      X/LA=0.4      X/LA=0.6      X/LA=0.75     X/LA=0.9      X/LA=1.0      CONE R=RB
  PEPSB=  0.69880-01    0.14720-01    0.15140-01    0.18930-01    0.21970-01    0.22520-01    0.22520-01    0.22520-01
  QDOT=   0.24640 04    0.42640 03    0.28280 03    0.25230 03    0.24090 03    0.22130 03    0.20930 03    0.20930 03
  MDOT=   0.28590 00    0.36930-01    0.22990-01    0.20160-01    0.24150-01    0.22300-01    0.20910-01    0.20910-01
  Q INT=  0.16590 05    0.22580 04    0.17280 04    0.14970 04    0.13540 04    0.12340 04    0.11690 04    0.11690 04
          Q INT(STAG)=  0.74290 05                                Q INT(SONIC)=  0.0          TURBULENT ONLY

                         TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0


                                  TRANSLATIONAL QUANTITIES

  TIME=  27.69   Z=   0.8000000 05   V=  0.22172970 05   GAMF= -0.20420 02   XR=   0.5973740 06   BETA=  0.16520 04
                 ZTR= 0.8679080 05   QD=     0.21070 05   MINF=  0.22680 02   VDOTOG=-0.12400 02   BETAP= 0.24390-01
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         TH=    0.0          TXT=    0.0          YR=    0.0          PSIALP= 0.0               D/W=   0.1275D 02

                                         DRAG QUANTITIES

         CD=    0.5467D-01   CDP=   0.4229D-01   CDFINF(BL,TURB,WB)=   0.6985D-02               CDB=   0.1778D-02
                             CDPO=  0.4229D-01   CDFINF(BL,TURB,NB)=   0.1360D-01               CDI=   0.3421D-02
                             XBAR=  0.3010D 00   REYINFLA=             0.1128D 08               XBARI= 0.4293D-02

                                         CONFIGURATION

         RN=    0.3152D 00   THETA= 0.7707D 01 . LA=    0.2152D 02   LAMBDA= 0.9891D-01   AREF=  0.2216D 00
         W=     0.2002D 02   DELW=  0.4587D 00   *ABL=  0.4587D 00   *THRST= 0.0

                                         MASS LOSS

         QDOT(STAG)= 0.1249D 05      QDOT(SONIC)= 0.8517D 04      HSRTO= 0.2932D 03      PSPO=  0.3837D 02
   X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
            TANG. PT.     X/LA=0.2      X/LA=0.4      X/LA=0.6      X/LA=0.75     X/LA=0.9      X/LA=1.0      CONE R=RB
   PEPSB=   0.6989D-01    0.1607D-01    0.1443D-01    0.1748D-01    0.2017D-01    0.2285D-01    0.2256D-01    0.2256D-01
   QDOT=    0.3378D 04    0.6816D 03    0.7317D 03    0.9893D 03    0.1156D 04    0.1244D 04    0.1181D 04    0.1188D 04
   MDOT=    0.4193D 00    0.7218D-01    0.7872D-01    0.1117D 00    0.1331D 00    0.1447D 00    0.1361D 00    0.1373D 00
   Q INT=   0.2033D 05    0.2967D 04    0.2378D 04    0.2292D 04    0.2249D 04    0.2172D 04    0.2059D 04    0.2064D 04
            Q INT(STAG)=  0.8926D 05                      Q INT(SONIC)=  0.5455D 04  TURBULENT ONLY

                           TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0



                                      TRANSLATIONAL QUANTITIES

   TIME=  20.00   Z=  0.7000000D 05   V=  0.2148219D 05   GAMF= -0.2045D 02   XR=   0.4191120 04   BETA=  0.1529D 04
                  ZTR= 0.8657230D 05  QD=    0.3212D 05   MINF=  0.2213D 02   VDOTOG=-0.2065D 02   BETAP= 0.1229D-01
                  TH=    0.0          TXT=   0.0          YR=    0.0          PSIALP= 0.0          D/W=   0.2100D 02

                                         DRAG QUANTITIES

         CD=    0.5810D-01   CDP=   0.4414D-01   CDFINF(BL,TURB,WB)=   0.8292D-02               CDB=   0.2003D-02
                             CDPO=  0.4414D-01   CDFINF(BL,TURB,NB)=   0.1539D-01               CDI=   0.4664D-02
                             XBAR=  0.2313D 00   REYINFLA=             0.1758D 08               XBARI= 0.3336D-02

                                         CONFIGURATION

         RN=    0.3553D 00   THETA= 0.7707D 01   LA=    0.2107D 02   LAMBDA= 0.1124D 00   AREF=  0.2181D 00
         W=     0.1972D 02   DELW=  0.7610D 00   *ABL=  0.7610D 00   *THRST= 0.0

                                         MASS LOSS

         QDOT(STAG)= 0.1357D 05      QDOT(SONIC)= 0.1099D 05      HSRTO= 0.2754D 03      PSPO=  0.2801D 02
   X STATIONS ARE PERCENTAGES OF UNABLATED LENGTH
            TANG. PT.     X/LA=0.2      X/LA=0.4      X/LA=0.6      X/LA=0.75     X/LA=0.9      X/LA=1.0      CONE R=RB
   PEPSB=   0.6990D-01    0.1859D-01    0.1406D-01    0.1629D-01    0.1860D-01    0.2101D-01    0.2260D-01    0.2264D-01
   QDOT=    0.4359D 04    0.9757D 03    0.7805D 03    0.1157D 04    0.1373D 04    0.1505D 04    0.1528D 04    0.1570D 04
   MDOT=    0.5527D 00    0.1115D 00    0.8614D-01    0.1356D 00    0.1634D 00    0.1813D 00    0.1836D 00    0.1892D 00
   Q INT=   0.2540D 05    0.4053D 04    0.3368D 04    0.3698D 04    0.3906D 04    0.3973D 04    0.3834D 04    0.3872D 04
            Q INT(STAG)=  0.1063D 06                      Q INT(SONIC)=  0.1823D 05  TURBULENT ONLY

                           TABULAR INPUT ANGLE OF ATTACK ALPHA =  0.0
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	TIME	Z	SMF	ALPHA PRIME
MAXIMUMS IN ALPHA PRIME	0.0	0.0	0.0	0.0
MINIMUMS IN ALPHA PRIME	0.0	0.0	0.0	0.0

BASIC DECOY CHARACTERISTICS

W1	THETA1	RN1	RB1	LAMDA1	LA1	W2	THETA2	RN2	RB2
20.40	7.71	0.10	3.20	0.03	23.00	0.0	0.0	0.0	0.0

LAMDA2	LA2	ZTURN	ZON	ZOFF	THO	TON	TOFF	ISP	NGEOM	LP
0.0	0.0	1.0000D 00	0.0	0.0	0.0	0.0	0.0	1.00	3	4

ALTITUDE	TIME	VELOCITY	DECELERATION	BETA
300000.0	0.0	23000.00	0.32	103.31
290000.0	1.27	23012.90	0.31	111.62
280000.0	2.54	23025.63	0.31	134.63
270000.0	3.81	23037.89	0.30	178.48
260000.0	5.07	23049.79	0.29	237.84
250000.0	6.33	23061.11	0.27	276.66
240000.0	7.59	23071.50	0.24	319.12
230000.0	8.85	23080.86	0.22	365.36
220000.0	10.11	23088.83	0.18	415.53
210000.0	11.37	23095.11	0.13	449.83
200000.0	12.62	23098.90	0.05	482.03
190000.0	13.88	23099.67	0.01	613.16
180000.0	15.13	23099.32	-0.02	809.59
170000.0	16.38	23097.62	-0.06	1049.77
160000.0	17.63	23093.94	-0.13	1303.00
150000.0	18.88	23085.10	-0.31	1422.51
140000.0	20.13	23068.12	-0.57	1541.97
130000.0	21.38	23037.90	-0.97	1652.57
120000.0	22.63	22987.40	-1.60	1750.62
110000.0	23.89	22904.85	-2.62	1830.42
100000.0	25.14	22770.07	-4.23	1881.06
90000.0	26.41	22551.68	-6.78	1896.33
80000.0	27.69	22172.97	-12.40	1652.40
70000.0	29.00	21482.19	-20.65	1529.48

ALTITUDE	TIME	WAKE R1	WAKE R2	WAKE R3	WAKE L1	WAKE L2	WAKE L3
300000.0	0.0	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
290000.0	1.27	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
280000.0	2.54	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
270000.0	3.81	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
260000.0	5.07	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
250000.0	6.33	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
240000.0	7.59	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
230000.0	8.85	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
220000.0	10.11	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
210000.0	11.37	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
200000.0	12.62	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
190000.0	13.88	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
180000.0	15.13	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
170000.0	16.38	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
160000.0	17.63	-1.08637240 01	1.00000000 00	1.00000000 00	84.22	0.0	0.0
150000.0	18.88	-1.11879140 01	0.0	0.0	65.24	0.0	0.0
140000.0	20.13	-1.19508400 01	0.0	0.0	60.69	0.0	0.0
130000.0	21.38	-1.30971430 01	0.0	0.0	84.37	0.0	0.0

120000.0	22.63	-1.46566610 01	0.0	0.0	104.06	0.0	0.0
110000.0	[illegible]	-1.66197610 01	0.0	0.0	122.34	0.0	0.0
100000.0	25.14	-1.89390200 01	0.0	0.0	131.88	0.0	0.0
90000.0	26.41	-2.150[illegible]1210 01	0.0	0.0	139.87	0.0	0.0
80000.0	27.69	-7.0141[illegible]30 01	0.0	0.0	0.0	0.0	0.0
70000.0	29.00	-7.14651170 01	0.0	0.0	0.0	0.0	0.0

VELOCTY INTEGRAL = 0.0 LEAVE CORRIDOR AT 0.0

INTEGRAL OF (VELOCTY/SIGMA)**2 4.10235630 04

WAKE L1 INTEGRAL = 0.0 LEAVE CORRIDOR AT 0.0

INTEGRAL OF (WAKE L1/SIGMA)**2 9.73304770 04

WAKE R1 INTEGRAL = 0.0 LEAVE CORRIDOR AT 0.0

INTEGRAL OF (WAKE R1/SIGMA)**2 8.37877140 05

MISC	W2/W1F	TH2/TH1F	RN2/RN1F	RB2/RB1F	LM2/LM1F	LA2/LA1F	W1/V1	W2/V2
	0.0	0.0	0.0	0.0	0.0	0.0	0.081	0.0

W2-W1F	TH2-TH1F	RN2-RN1F	RB2-RB1F	LM2-LM1F	LA2-LA1F
0.0	0.0	0.0	0.0	0.0	0.0

II	LOWER BOUND	UPPER BOUND	OCCUR(II)	PENALTY
133	0.0	4.00000000 01	2.04800000 01	0.0
3915	0.0	0.0	0.0	0.0
3941	0.0	0.0	0.0	0.0
3944	0.0	0.0	0.0	0.0
136	1.50000000D 00	4.00000000 00	3.20000000 00	0.0
138	1.80000000D 01	4.80000000 01	2.30000000 01	0.0
134	4.00000000D 00	1.20000000 01	7.70709340 00	0.0
137	0.0	5.00000000-01	3.12500000-02	0.0
3965	0.0	0.0	2.06022280 00	0.0
3962	0.0	0.0	1.51502960-01	0.0

FEV F = 0.0 X = 3.20000000 00 2.30000000 01

KRED = 0 ITERM = -1

CASE 2.027 DATE 10.07 MEMO 1.0 2542F

BASIC DECOY CHARACTERISTICS

W1	THETA1	PHI	RB1	LAMDA1	LA1	W2	THETA2	RN2	RB2
16.30	7.71	0.10	3.20	0.03	23.00	0.0	0.0	0.0	0.0
LAMDA2	LA2	ZTURN	ZON	ZOFF	THO	TON	TOFF	ISP NGEOM	LP
0.0	0.0	-1.00000 00	0.0	0.0	0.0	0.0	0.0	1.00 3	4

ALTITUDE	TIME	VELOCITY	DECELERATION	BETA
300000.0	0.0	23000.00	0.32	82.65
290000.0	1.27	23012.83	0.31	89.30
280000.0	2.54	23025.23	0.30	107.71
270000.0	3.81	23037.16	0.29	142.78
260000.0	5.07	23048.61	0.27	190.27
250000.0	6.33	23059.35	0.25	221.34
240000.0	7.59	23068.93	0.22	255.31
230000.0	8.85	23077.22	0.18	292.30
220000.0	10.11	23083.78	0.14	332.45
210000.0	11.37	23088.21	0.08	375.90
200000.0	12.63	23089.54	-0.03	385.68
190000.0	13.88	23087.11	-0.08	490.79
180000.0	15.13	23083.27	-0.11	647.98
170000.0	16.39	23077.75	-0.16	840.06
160000.0	17.64	23069.74	-0.25	1041.65
150000.0	18.89	23055.29	-0.47	1136.92
140000.0	20.14	23030.66	-0.79	1232.01
130000.0	21.39	22989.33	-1.30	1319.85
120000.0	22.65	22922.50	-2.08	1397.44
110000.0	23.90	22815.23	-3.34	1460.23
100000.0	25.17	22642.08	-5.33	1499.66
90000.0	26.44	22365.24	-8.45	1511.14
80000.0	27.74	21891.57	-15.28	1314.06
70000.0	29.07	21032.16	-25.09	1210.12

ALTITUDE	TIME	WAKE R1	WAKE R2	WAKE R3	WAKE L1	WAKE L2	WAKE L3
300000.0	0.0	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
290000.0	1.27	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
280000.0	2.54	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
270000.0	3.81	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
260000.0	5.07	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
250000.0	6.33	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
240000.0	7.59	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
230000.0	8.85	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
220000.0	10.11	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
210000.0	11.37	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
200000.0	12.63	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
190000.0	13.88	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
180000.0	15.13	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
170000.0	16.39	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
160000.0	17.64	-1.08735580 01	1.00000000 00	1.00000000 00	84.02	0.0	0.0
150000.0	18.89	-1.11958920 01	0.0	0.0	65.05	0.0	0.0
140000.0	20.14	-1.19716990 01	0.0	0.0	54.65	0.0	0.0
130000.0	21.39	-1.31250400 01	0.0	0.0	83.08	0.0	0.0
120000.0	22.65	-1.46948620 01	0.0	0.0	103.89	0.0	0.0
110000.0	23.90	-1.66736550 01	0.0	0.0	122.36	0.0	0.0
100000.0	25.17	-1.90179240 01	0.0	0.0	133.15	0.0	0.0
90000.0	26.44	-2.16230970 01	0.0	0.0	135.66	0.0	0.0
80000.0	27.74	-7.06865520 01	0.0	0.0	0.0	0.0	0.0
70000.0	29.07	-7.18069280 01	0.0	0.0	0.0	0.0	0.0

```
VELOCITY INTEGRAL =   3.80962910 06 LEAVE CORRIDOR AT   1.17132900 05
INTEGRAL OF ( VELOCTY/SIGMA)**2  2.38429620 05
WAKE L1 INTEGRAL =    0.0            LEAVE CORRIDOR AT   0.0
INTEGRAL OF ( WAKE L1/SIGMA)**2  9.78318360 04
WAKE R1 INTEGRAL =    0.0            LEAVE CORRIDOR AT   0.0
INTEGRAL OF ( WAKE R1/SIGMA)**2  8.35969020 05
MISC        W2/W1F       TH2/TH1F      RN2/RN1F      RB2/RB1F      LM2/LM1F      LA2/LA1F      W1/V1       W2/V2
              0.0           0.0           0.0           0.0           0.0           0.0         0.065       0.0
              W2-W1F        TH2-TH1F      RN2-RN1F      RB2-RB1F      LM2-LM1F      LA2-LA1F
          0.0           0.0           0.0           0.0           0.0           0.0
   IZ   LOWER BOUND       UPPER BOUND       OCCUR(IZ)        PENALTY
  133   0.0               4.00000000 01    1.43840000 01   0.0
 3915   0.0               0.0              3.80962910 06   1.45132740 08
 3941   0.0               0.0              0.0             0.0
 3944   0.0               0.0              0.0             0.0
  136   1.50000000 00     4.00000000 00    3.20000000 00   0.0
  138   1.50000000 01     4.80000000 01    2.30000000 01   0.0
  134   4.00000000 00     1.20000000 01    7.70709340 00   0.0
  137   0.0               5.00000000-01    3.12500000-02   0.0
 3968   0.0               0.0              2.25757710 00   0.0
 3962   0.0               0.0              2.02519810-01   0.0
AFEVA   F =   1.45132740 08 X =   3.20000000 00   2.30000000 01

  NTRIA      N NSTAG NSUC,                             0
    1        1    0       0145132738.6428538000
P(I) I = 1 TO  2
        3.2000000006?         23.2000000000
  IN ROSBRK  OP =
  1        0.10000000 00          0.0
P(I) I = 1 TO  2
       3.30000000 00          2.30000000 01
  IN ROSBRK  N =   1   E(N) =     0.1000000000 00
```

CASE 2.056 DATE 10.07 MEMO 1.0 2542F

BASIC DECOY CHARACTERISTICS

W1	THETA1	RN1	RB1	LAMDA1	LA1	W2	THETA2	RN2	RB2
10.38	7.39	0.10	3.01	0.03	22.52	0.0	0.0	0.0	0.0

LAMDA2	LA2	ZTURN	ZON	ZOFF	THO	TON	TOFF	ISP	NGEOM	LP
0.0	0.0	-1.00000 00	0.0	0.0	0.0	0.0	0.0	1.00	3	4

ALTITUDE	TIME	VELOCITY	DECELERATION	BETA
300000.0	0.0	23000.00	0.32	92.92
290000.0	1.27	23012.91	0.31	100.35
280000.0	2.54	23025.45	0.30	120.81
270000.0	3.81	23037.56	0.29	160.81
260000.0	5.07	23049.27	0.28	216.41
250000.0	6.33	23060.37	0.26	251.53
240000.0	7.59	23070.43	0.24	289.91
230000.0	8.85	23079.35	0.20	331.67
220000.0	10.11	23086.75	0.16	376.96
210000.0	11.37	23092.27	0.11	425.96
200000.0	12.62	23095.05	0.02	436.94
190000.0	13.88	23093.66	-0.05	520.39
180000.0	15.13	23090.87	-0.09	691.25
170000.0	16.38	23086.65	-0.13	907.76
160000.0	17.64	23080.47	-0.18	1176.13
150000.0	18.89	23070.33	-0.35	1335.43
140000.0	20.14	23051.20	-0.62	1455.44
130000.0	21.39	23018.38	-1.04	1566.87
120000.0	22.64	22964.30	-1.70	1665.51
110000.0	23.89	22876.41	-2.75	1745.11
100000.0	25.15	22733.26	-4.43	1794.35
90000.0	26.42	22503.16	-7.10	1806.63
80000.0	27.71	22115.51	-12.67	1610.43
70000.0	29.02	21395.81	-21.69	1446.01

ALTITUDE	TIME	WAKE R1	WAKE R2	WAKE R3	WAKE L1	WAKE L2	WAKE L3
300000.0	0.0	1.00000000D 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
290000.0	1.27	1.00000000D 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
280000.0	2.54	1.00000000D 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
270000.0	3.81	1.00000000D 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
260000.0	5.07	1.00000000D 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
250000.0	6.33	1.00000000D 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
240000.0	7.59	1.00000000D 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
230000.0	8.85	1.00000000D 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
220000.0	10.11	1.00000000D 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
210000.0	11.37	1.00000000D 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
200000.0	12.62	1.00000000D 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
190000.0	13.88	1.00000000D 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
180000.0	15.13	1.00000000D 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
170000.0	16.38	1.00000000D 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
160000.0	17.64	1.00000000D 00	1.00000000D 00	1.00000000D 00	0.0	0.0	0.0
150000.0	18.89	-1.19429160D 01	1.00000000D 00	1.00000000D 00	59.43	0.0	0.0
140000.0	20.14	-1.26321020D 01	0.0	0.0	57.82	0.0	0.0
130000.0	21.39	-1.37360810D 01	0.0	0.0	85.75	0.0	0.0
120000.0	22.64	-1.52468580D 01	0.0	0.0	108.46	0.0	0.0
110000.0	23.90	-1.71627780 01	0.0	0.0	121.85	0.0	0.0
100000.0	25.15	-1.94472700 01	0.0	0.0	133.89	0.0	0.0
90000.0	26.42	-2.19879810 01	0.0	0.0	140.19	0.0	0.0
80000.0	27.71	-7.19718490 01	0.0	0.0	0.0	0.0	0.0
70000.0	29.02	-7.19524860 01	0.0	0.0	0.0	0.0	0.0

```
VELOCTY INTEGRAL =   0.0            LEAVE CORRIDOR AT  0.0

INTEGRAL OF ( VELOCTY/SIGMA)**2  7.47516910 04

WAKE L1 INTEGRAL =   4.17905600 04 LEAVE CORRIDOR AT  1.60596460 05

INTEGRAL OF ( WAKE L1/SIGMA)**2  1.00413840 05

WAKE R1 INTEGRAL =   0.0            LEAVE CORRIDOR AT  0.0

INTEGRAL OF ( WAKE R1/SIGMA)**2  8.31987310 05

MISC        W2/W1F      TH2/TH1F     RN2/RN1F     RB2/RB1F     LM2/LM1F     LA2/LA1F      W1/V1       W2/V2
              0.0         0.0          0.0          0.0          0.0          0.0         0.074       0.0

            W2-W1F      TH2-TH1F     RN2-RN1F     RB2-RB1F     LM2-LM1F     LA2-LA1F
              0.0         0.0          0.0          0.0          0.0          0.0

  II   LOWER BOUND     UPPER BOUND      OCCUR(II)       PENALTY
 133  0.0             4.00000000D 01  1.63840000D 01  0.0
3915  0.0             0.0             0.0             0.0
3941  0.0             0.0             4.17905600D 04  1.74645090D 04
3944  0.0             0.0             0.0             0.0
 136  1.50000000D 00  4.00000000D 00  3.00900100D 00  0.0
 138  1.50000000D 01  4.80000000D 01  2.25226500D 01  0.0
 134  4.00000000D 00  1.20000000D 01  7.38987190D 00  0.0
 137  0.0             5.00000000D-01  3.32336210D-02  0.0
3965  0.0             0.0             2.09258820D 00  0.0
3962  0.0             0.0             1.59226160D-01  0.0
*FEV*  F =  1.74645090 04 X =  3.00900100 00  2.25226500 01

NTRIA     N NSTAG NSUCC              U
   30     2    2     1    17464.5093089967
P(I) I = 1 TO  2
       3.0090010083       22.5226503878

ROSBRK SEARCH IS COMPLETE.

FINAL PERFORMANCE FUNCTION.   ULAST =     0.17460328270 05
FINAL PARAMETERS ARE
      0.30103145770 01    0.22522002080 02

NUMBER OF TRIALS =     30
NUMBER OF STAGES =      2
```

```
                                                      18.00.11.50     11/07/68
INPUT CARDS READ                                                 2241-3  *DATA
DATA* CASE  3.0                                                  2241-3  *DATA
DATA*H DECOY EVALUATION WITH PLOTS                               2241-3  *DATA
DATA* IPROC  2 NPLOT  1  1  1 IOP(1)  1 (22)  1 (25)  1 (77)  1 (80)  1  2241-3  *DATA
DATA* IOP(13)  1 (46)  1 (49)  1                                         *DATA
DATA*  OVECT  3.20  23.0  WI  20.48                                      *DATA
DATA*  LRED   0                                                          *DATA
DATA*1
```

DECOY EVALUATION WITH PLOTS 2241-3

CASE 3.001 DATE 10.07 MEMO 1.0 2542F

BASIC DECOY CHARACTERISTICS

M1	THETA1	RN1	RB1	LAMDA1	LA1	M2	THETA2	RN2	RB2	
20.48	7.71	0.10	3.20	0.03	23.00	0.0	0.0	0.0	0.0	
LAMDA2	LA2	ZTURN	ZON	ZOFF	THO	TON	TOFF	ISP	NGEOM	LP
0.0	0.0	-1.00000 00	0.0	0.0	0.0	0.0	0.0	1.00	3	4

ALTITUDE	TIME	VELOCITY	DECELERATION	BETA
300000.0	0.0	23000.00	0.32	103.31
290000.0	1.27	23012.98	0.31	111.62
280000.0	2.54	23025.63	0.31	134.63
270000.0	3.81	23037.89	0.30	178.48
260000.0	5.07	23049.79	0.29	237.84
250000.0	6.33	23061.11	0.27	276.66
240000.0	7.59	23071.50	0.24	319.12
230000.0	8.85	23080.86	0.22	365.36
220000.0	10.11	23088.83	0.18	415.53
210000.0	11.37	23095.11	0.13	449.83
200000.0	12.62	23098.90	0.05	482.03
190000.0	13.88	23099.67	0.01	613.16
180000.0	15.13	23099.32	-0.02	809.59
170000.0	16.38	23097.62	-0.06	1049.77
160000.0	17.63	23093.94	-0.13	1303.00
150000.0	18.88	23085.10	-0.31	1422.61
140000.0	20.13	23068.12	-0.57	1541.97
130000.0	21.38	23037.90	-0.97	1652.57
120000.0	22.63	22987.40	-1.60	1750.62
110000.0	23.89	22906.85	-2.62	1830.42
100000.0	25.14	22770.07	-4.23	1881.06
90000.0	26.41	22551.58	-6.78	1806.33
80000.0	27.69	22172.97	-12.40	1652.40
70000.0	29.00	21482.19	-20.65	1529.48

ALTITUDE	TIME	WAKE R1	WAKE R2	WAKE R3	WAKE L1	WAKE L2	WAKE L3
300000.0	0.0	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
290000.0	1.27	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
280000.0	2.54	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
270000.0	3.81	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
260000.0	5.07	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
250000.0	6.33	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
240000.0	7.59	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
230000.0	8.85	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
220000.0	10.11	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
210000.0	11.37	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
200000.0	12.62	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
190000.0	13.88	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
180000.0	15.13	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
170000.0	16.38	1.00000000 00	1.00000000 00	1.00000000 00	0.0	0.0	0.0
160000.0	17.63	-1.08637240 01	1.00000000 00	1.00000000 00	84.22	0.0	0.0
150000.0	18.88	-1.11879140 01	1.00000000 00	1.00000000 00	65.24	0.0	0.0
140000.0	20.13	-1.19508400 01	0.0	0.0	60.69	0.0	0.0
130000.0	21.38	-1.30971430 01	0.0	0.0	84.37	0.0	0.0
120000.0	22.63	-1.46566610 01	0.0	0.0	104.06	0.0	0.0
110000.0	23.89	-1.64107410 01	0.0	0.0	122.34	0.0	0.0
100000.0	25.14	-1.89390200 01	0.0	0.0	131.88	0.0	0.0
90000.0	26.41	-2.15041210 01	0.0	0.0	139.87	0.0	0.0
80000.0	27.69	-7.01416430 01	0.0	0.0	0.0	0.0	0.0
70000.0	29.00	-7.14651170 01	0.0	0.0	0.0	0.0	0.0

ALTITUDE	TIME	LOWER CORRIDR	RV-DE VELOCTY	UPPER CORRIDR	INTEGRL VALUE	LEAVE CORRIDR	ENTER CORRIDR	SLOPE
300000.0	0.0	-30.00	0.0	30.00	0.0			
290000.0	1.27	-31.00	0.30	31.00	0.0			
280000.0	2.54	-32.00	0.83	32.00	0.0			
270000.0	3.81	-33.00	1.56	33.00	0.0			
260000.0	5.07	-34.00	2.34	34.00	0.0			
250000.0	6.33	-35.00	3.37	35.00	0.0			
240000.0	7.59	-36.00	4.91	36.00	0.0			
230000.0	8.85	-37.00	7.52	37.00	0.0			
220000.0	10.11	-38.00	10.61	38.00	0.0			
210000.0	11.37	-39.00	14.64	39.00	0.0			
200000.0	12.62	-40.00	20.26	40.00	0.0			
190000.0	13.88	-54.00	27.55	54.00	0.0			
180000.0	15.13	-68.00	34.94	68.00	0.0			
170000.0	16.38	-82.00	42.06	82.00	0.0			
160000.0	17.63	-96.00	47.[illegible]	96.00	0.0			
150000.0	18.88	-110.00	53.[illegible]	110.00	0.0			
140000.0	20.13	-122.00	59.93	122.00	0.0			
130000.0	21.38	-134.00	68.53	134.00	0.0			
120000.0	22.63	-146.00	78.01	146.00	0.0			
110000.0	23.89	-158.00	76.08	158.00	0.0			
100000.0	25.14	-170.00	62.25	170.00	0.0			
90000.0	26.41	-180.00	40.33	180.00	0.0			
80000.0	27.69	-190.00	34.60	190.00	0.0			
70000.0	29.00	-200.00	112.90	200.00	0.0			

INTEGRAL OF (VELOCTY/SIGMA)**2 4.1023563D 04

ALTITUDE	TIME	LOWER CORRIDR	RV-DE WAKE L1	UPPER CORRIDR	INTEGRL VALUE	LEAVE CORRIDR	ENTER CORRIDR	SLOPE
300000.0	0.0	-400.00	0.0	650.00	0.0			
290000.0	1.27	-400.00	0.0	645.00	0.0			
280000.0	2.54	-400.00	0.0	640.00	0.0			
270000.0	3.81	-400.00	0.0	635.00	0.0			
260000.0	5.07	-400.00	0.0	630.00	0.0			
250000.0	6.33	-400.00	0.0	625.00	0.0			
240000.0	7.59	-400.00	0.0	620.00	0.0			
230000.0	8.85	-400.00	0.0	615.00	0.0			
220000.0	10.11	-400.00	0.0	610.00	0.0			
210000.0	11.37	-400.00	0.0	605.00	0.0			
200000.0	12.62	-400.00	0.0	600.00	0.0			
190000.0	13.88	-380.00	0.0	590.00	0.0			
180000.0	15.13	-360.00	0.0	580.00	0.0			
170000.0	16.38	-340.00	0.0	570.00	0.0			
160000.0	17.63	-320.00	511.94	560.00	0.0			
150000.0	18.88	-300.00	369.54	550.00	0.0			
140000.0	20.13	-276.00	238.17	510.00	0.0			
130000.0	21.38	-252.00	110.00	470.00	0.0			
120000.0	22.63	-228.00	-104.06	430.00	0.0			
110000.0	23.89	-204.00	-122.34	390.00	0.0			
100000.0	25.14	-180.00	-131.88	350.00	0.0			
90000.0	26.41	-153.33	-139.87	300.00	0.0			
80000.0	27.69	-126.67	0.00	250.00	0.0			
70000.0	29.00	-100.00	0.0	200.00	0.0			

INTEGRAL OF (WAKE L1/SIGMA)**2 9.7338477D 04

ALTITUDE	TIME	LOWER CORRIDR	RV-DE WAKE R1	UPPER CORRIDR	INTEGRL VALUE	LEAVE CORRIDR	ENTER CORRIDR	SLOPE
300000.0	0.0	-40.00	0.0	30.00	0.0			
290000.0	1.27	-40.00	0.0	30.00	0.0			
280000.0	2.54	-40.00	0.0	30.00	0.0			

270000.0	3.81	-40.00	0.0	30.00	0.0
260000.0	5.07	-40.00	0.0	30.00	0.0
250000.0	6.33	-40.00	0.0	30.00	0.0
240000.0	7.59	-40.00	0.0	30.00	0.0
230000.0	8.85	-40.00	0.0	30.00	0.0
220000.0	10.11	-40.00	0.0	30.00	0.0
210000.0	11.37	-40.00	0.0	30.00	0.0
200000.0	12.62	-40.00	0.0	30.00	0.0
190000.0	13.88	-41.60	0.0	31.60	0.0
180000.0	15.13	-43.20	0.0	33.20	0.0
170000.0	16.38	-44.80	0.0	34.80	0.0
160000.0	17.63	-46.40	13.19	36.40	0.0
150000.0	18.88	-48.00	13.52	38.00	0.0
140000.0	20.13	-49.60	13.64	39.60	0.0
130000.0	21.38	-51.20	12.66	41.20	0.0
120000.0	22.63	-52.80	-47.92	42.80	0.0
110000.0	23.89	-54.40	-45.35	44.40	0.0
100000.0	25.14	-56.00	-43.04	46.00	0.0
90000.0	26.41	-57.33	-40.84	47.33	0.0
80000.0	27.69	-58.67	6.89	48.67	0.0
70000.0	29.00	-60.00	6.11	50.00	0.0

INTEGRAL OF (WAKE R1/SIGMA)**2 8.3787714D 05

MISC	W2/W1F	TH2/TH1F	RN2/RN1F	RB2/RB1F	LM2/LM1F	LA2/LA1F	W1/V1	W2/V2
	0.0	0.0	0.0	0.0	0.0	0.0	0.081	0.0

W2-W1F	TH2-TH1F	RN2-RN1F	RB2-RB1F	LM2-LM1F	LA2-LA1F
0.0	0.0	0.0	0.0	0.0	0.0

IZ	LOWER BOUND	UPPER BOUND	OCCUR(IZ)	PENALTY
133	0.0	4.00000000 01	2.04800000 01	0.0
3915	0.0	0.0	0.0	0.0
3941	0.0	0.0	0.0	0.0
3944	0.0	0.0	0.0	0.0
136	1.50000000 00	4.00000000 00	3.20000000 00	0.0
138	1.50000000D 01	4.80000000 01	2.30000000 01	0.0
134	4.00000000 00	1.20000000 01	7.70709340 00	0.0
137	0.0	5.00000000-01	3.12500000-02	0.0
3965	0.0	0.0	2.06022280 00	0.0
3962	0.0	0.0	1.51502960-01	0.0

FEV F = 0.0 X = 3.20000000 00 2.30000000 01

KREO = -1 ITERM = -1

```
                                                                   18.01.33.71      11/07/68
INPUT CARDS READ                                                              2241-4   *DATA
DATA* CASE  4.0                                                               2241-4   *DATA
DATA*H ROSENBROCK UNCONSTRAINED OPTIMIZER EXAMPLE                             2241-4   *DATA
DATA* MODE  3 ICON(1)  1 IREF  2 MOPT  5 A   0.625  -0.75  0.625  -1.75       2241-4   *DATA
DATA* 0.25  2.625 IPROC  4 ICON(3)  0 LIMIT  200 LRED  0 IEX  1 IN  2         2241-4   *DATA
DATA* IDNO  1  2 DELX  0.01  0.01 OVECT  0.0  0.0 NCONS  1 IOC  400           2241-4   *DATA
DATA* AMULT  1.0 CALOW  0.0 CTP  0.0                                                   *DATA
DATA*1
```

```
ROSENBROCK UNCONSTRAINED OPTIMIZER EXAMPLE                                  2241-4

   IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0               0.0             2.62500000D 00   2.62500000D 00
*FEV*   F =   2.62500000D 00 X =    0.0              0.0

  NTRIA       N NSTAG NSUCC                    U
    1         1    0     0          2.6250000000
 P(I) I = 1 TO  2
            0.0                 0.0

 IN ROSBRK DP =
 1          0.10000000D-01      0.0

 P(I) I = 1 TO  2
          1.00000000D-02        0.0

 IN ROSBRK N =   1  E(N) =     0.10000000000D-01

   IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0               0.0             2.60756250D 00   2.60756250D 00
*FEV*   F =   2.60756250D 00 X =    1.00000000D-02   0.0

  NTRIA       N NSTAG NSUCC                    U
    2         1    0     1          2.6075625000
 P(I) I = 1 TO  2
            0.0100000000        0.0

 IN ROSBRK DP =
 1          0.30000000D-01      0.0

 P(I) I = 1 TO  2
          4.00000000D-02        0.0

 IN ROSBRK N =   1  E(N) =     0.30000000000D-01

   IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0               0.0             2.55600000D 00   2.55600000D 00
*FEV*   F =   2.55600000D 00 X =    4.00000000D-02   0.0

  NTRIA       N NSTAG NSUCC                    U
    3         1    0     2          2.5560000000
 P(I) I = 1 TO  2
            0.0400000000        0.0

 IN ROSBRK DP =
 1          0.90000000D-01      0.0

 P(I) I = 1 TO  2
          1.30000000D-01        0.0

 IN ROSBRK N =   1  E(N) =     0.90000000000D-01

   IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0               0.0             2.40806250D 00   2.40806250D 00
*FEV*   F =   2.40806250D 00 X =    1.30000000D-01   0.0

  NTRIA       N NSTAG NSUCC                    U
    4         1    0     3          2.4080625000
 P(I) I = 1 TO  2
```

```
          0.1300000000         0.0

  IN ROSBRK DP =
  1       0.27000000 00        0.0

  P(I) I = 1 TO  2
          4.00000000-01        0.0

  IN ROSBRK N =  1  E(N) =     0.27000000000 00

    IZ      LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
   400  0.0                  0.0              2.02500000 00   2.02500000 00
  *FEV*  F =  2.02500000 00 X =  4.00000000-01  0.0

   NTRIA      N NSTAG NSUCC                      U
       5      1     0     4         2.0250000000
  P(I) I = 1 TO  2
          0.4000000000         0.0

  IN ROSBRK DP =
  1       0.81000000 00        0.0

  P(I) I = 1 TO  2
        1.21000000 00          0.0

  IN ROSBRK N =  1  E(N) =     0.81000000000 00

    IZ      LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
   400  0.0                  0.0              1.42256250 00   1.42256250 00
  *FEV*  F =  1.42256250 00 X =  1.21000000 00  0.0

   NTRIA      N NSTAG NSUCC                      U
       6      1     0     5         1.4225625000
  P(I) I = 1 TO  2
          1.2100000000         0.0

  IN ROSBRK DP =
  1       0.24300000 01        0.0

  P(I) I = 1 TO  2
        3.64000000 00          0.0

  IN ROSBRK N =  1  E(N) =     0.24300000000 01

    IZ      LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
   400  0.0                  0.0              4.53600000 00   4.53600000 00
  *FEV*  F =  4.53600000 00 X =  3.64000000 00  0.0

   NTRIA      N NSTAG NSUCC                      U
       7      1     0     5         4.5360000000
  P(I) I = 1 TO  2
          3.6400000000         0.0

  IN ROSBRK DP =
  1       0.0                  0.10000000-01

  P(I) I = 1 TO  2
        1.21000000 00          1.00000000-02
```

```
IN ROSBRK N =  2  E(N) =     0.10000000000-01

    IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
   400   0.0               0.0              1.41605000 00  1.41605000 00
 *FEV*   F =   1.41605000 00 X =   1.21000000 00   1.00000000-02

   NTRIA       N NSTAG NSUCC                      U
       8       2     0     1         1.4160500000
 P(I)  I = 1 TO  2
            1.2100000000          0.0100000000

 IN ROSBRK DP =
 1          0.0                   0.30000000-01

 P(I)  I = 1 TO  2
           1.21000000 00        4.00000000-02

 IN ROSBRK N =  2  E(N) =     0.30000000000-01

    IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
   400   0.0               0.0              1.39726250 00  1.39726250 00
 *FEV*   F =   1.39726250 00 X =   1.21000000 00   4.00000000-02

   NTRIA       N NSTAG NSUCC                      U
       9       2     0     2         1.3972625000
 P(I)  I = 1 TO  2
            1.2100000000          0.0400000000

 IN ROSBRK DP =
 1          0.0                   0.90000000-01

 P(I)  I = 1 TO  2
           1.21000000 00        1.30000000-01

 IN ROSBRK N =  2  E(N) =     0.90000000000-01

    IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
   400   0.0               0.0              1.34765000 00  1.34765000 00
 *FEV*   F =   1.34765000 00 X =   1.21000000 00   1.30000000-01

   NTRIA       N NSTAG NSUCC                      U
      10       2     0     3         1.3476500000
 P(I)  I = 1 TO  2
            1.2100000000          0.1300000000

 IN ROSBRK DP =
 1          0.0                   0.27000000 00

 P(I)  I = 1 TO  2
           1.21000000 00        4.00000000-01

 IN ROSBRK N =  2  E(N) =     0.27000000000 00

    IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
   400   0.0               0.0              1.25956250 00  1.25956250 00
 *FEV*   F =   1.25956250 00 X =   1.21000000 00   4.00000000-01

   NTRIA       N NSTAG NSUCC                      U
      11       2     0     4         1.2595625000
 P(I)  I = 1 TO  2
```

```
          1.2100000000          0.4000000000

 IN ROSBRK DP =
 1        0.0                   0.81000000 00

 P(I) I = 1 TO  2
          1.21000000 00        1.21000000 00

 IN ROSBRK N =  2  F(N) =      0.81000000000 00

   IZ    LOWER BOUND       UPPER BOUND       OCCUR(IZ)        PENALTY
  400    0.0                    0.0        1.54205000 00   1.54205000 00
 *FEV*   F =   1.54205000 00 X =   1.21000000 00   1.21000000 00

  NTRIA       N NSTAG NSUCC                    U
     12       2    0     4             1.5420500000
 P(I) I = 1 TO  2
          1.2100000000          1.2100000000

 C MATRIX FROM BRAH
          0.9494650593         -0.3138727469
          0.3138727469          0.9494650593

 C MATRIX FROM ROSBRK

  9.49D-01  -3.14D-01
  3.14D-01   9.49D-01

  NTRIA       N NSTAG NSUCC                    U
     12       1    1     0             1.2595625000
 P(I) I = 1 TO  2
          1.2100000000          0.4000000000

 IN ROSBRK DP =
 1        0.57447640 00         0.18989300 00

 P(I) I = 1 TO  2
          1.78442640 00        5.89893010-01

 IN ROSBRK N =  1  F(N) =      0.60500000000 00

   IZ    LOWER BOUND       UPPER BOUND       OCCUR(IZ)        PENALTY
  400    0.0                    0.0        1.06785610 00   1.06785610 00
 *FEV*   F =   1.06785610 00 X =   1.78442640 00   5.89893010-01

  NTRIA       N NSTAG NSUCC                    U
     13       1    1     1             1.0678561429
 P(I) I = 1 TO  2
          1.7844263609          0.5898930119

 IN ROSBRK DP =
 1        0.17232790 01         0.56967900 00

 P(I) I = 1 TO  2
          3.50770540 00        1.15957200 00

 IN ROSBRK N =  1  E(N) =      0.19150000000 01

   IZ    LOWER BOUND       UPPER BOUND       OCCUR(IZ)        PENALTY
  400    0.0                    1.0        2.25620850 00   2.25620860 00
```

```
*FEV*  F =  2.2562086D 00 X =  3.5077054D 00  1.1595720D 00

  NTRIA      N NSTAG NSUCC                          U
    14       1    1     1          2.2562086057
 P(I) I = 1 TO  2
            3.5077054434          1.1595720474

 IN ROSBRK DP =
 1       -0.6277455D-01          0.1898930D 00

 P(I) I = 1 TO  2
            1.7216518D 00         7.7978602D-01

 IN ROSBRK N =   2  E(N) =     0.20000000000 00

    IZ     LOWER BOUND      UPPER BOUND        OCCUR(IZ)           PENALTY
  400   0.0                0.0              1.0327603D 00   1.0327603D 00
 *FEVA  F =  1.0327603D 00 X =  1.7216518D 00  7.7978602D-01

  NTRIA      N NSTAG NSUCC                          U
    15       2    1     1          1.0327603223
 P(I) I = 1 TO  2
          1.7216518115          0.7797860237

 IN ROSBRK DP =
 1       -0.1882234D 00          0.5696790D 00

 P(I) I = 1 TO  2
          1.5333282D 00          1.3494651D 00

 IN ROSBRK N =   2  E(N) =     0.60000000000 00

    IZ     LOWER BOUND      UPPER BOUND        OCCUR(IZ)           PENALTY
  400   0.0                0.0              1.3347569D 00   1.3347569D 00
 *FEV*  F =  1.3347569D 00 X =  1.5333282D 00  1.3494651D 00

  NTRIA      N NSTAG NSUCC                          U
    16       2    1     1          1.3347568950
 P(I) I = 1 TO  2
          1.5333281634          1.3494650593

 C MATRIX FROM GRAM
          0.8029677975          -0.5960224124
          0.5960224124           0.8029677975

 C MATRIX FROM ROSBRK

 8.03D-01 -5.96D-01
 5.96D-01  8.03D-01

  NTRIA      N NSTAG NSUCC                          U
    16       1    2     0          1.0327603223
 P(I) I = 1 TO  2
          1.7216518115          0.7797860237

 IN ROSBRK DP =
 1        0.2428978D 00          0.1802968D 00

 P(I) I = 1 TO  2
          1.9645496D 0           9.6008280D-01
```

```
IN ROSBRK N =  1  E(N) =     0.30250000000 00

   IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)        PENALTY
  400     0.0                  0.0          1.0007200D 00   1.0007200D 00
 *FEV*   F =   1.0007200D 00 X =   1.9645496D 00   9.6008280D-01

  NTRIA       N NSTAG NSUCC                      U
   17         1    2     1            1.0007200109
 P(I) I = 1 TO  2
             1.9645495702           0.9600828035

 IN ROSBRK DP =
 1         0.72869330 00           0.54089030 00

 P(I) I = 1 TO  2
             2.69324280 00          1.50097310 00

 IN ROSBRK N =   1  E(N) =     0.90750000000 00

   IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)        PENALTY
  400   0.0                  0.0          1.1967528D 00   1.1967528D 00
 *FEV*   F =  1.1967528D 00 X =  2.6932428D 00   1.5009731D 00

  NTRIA       N NSTAG NSUCC                      U
   18         1    2     1            1.1967527981
 P(I) I = 1 TO  2
             2.6932428465           1.5009731427

 IN ROSBRK DP =
 1        -0.59602240-01           0.80296780-01

 P(I) I = 1 TO  2
             1.90494730 00          1.04037960 00

 IN ROSBRK N =  2  E(N) =     0.10000000000 00

   IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)        PENALTY
  400   0.0                 0.0          1.0095446D 00   1.0095446D 00
 *FEV*   F =  1.0095446D 00 X =  1.9049473D 00   1.0403796D 00

  NTRIA       N NSTAG NSUCC                      U
   19         2    2     0            1.0095445911
 P(I) I = 1 TO  2
             1.9049473290           1.0403795832

 IN ROSBRK DP =
 1         0.29801120-01          -0.40148390-01

 P(I) I = 1 TO  2
             1.99435070 00          9.19934410-01

 IN ROSBRK N =  2  E(N) =     -0.50000000000-01

   IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)        PENALTY
  400   0.0                 0.0          1.0036873D 00   1.0036873D 00
 *FEV*   F =  1.0036873D 00 X =  1.9943507D 00   9.1993441D-01

  NTRIA       N NSTAG NSUCC                      U
   20         2    2     0            1.0036872716
 P(I) I = 1 TO  2
```

```
         1.9943506909        0.9199344136

   IN ROSBRK DP =
   1       -0.1490056D-01       0.2007419D-01

   P(I) I = 1 TO  2
         1.9496490D 00       9.8015700D-01

   IN ROSBRK N =  2  E(N) =     0.2500000000D-01

     IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)       PENALTY
    400   0.0             0.0           1.0010813D 00  1.0010813D 00
   *FEV*  F =  1.0010813D 00 X =  1.9496490D 00  9.8015700D-01

    NTRIA      N NSTAG NSUCC                U
      21       2    2     0          1.0010812682
   P(I) I = 1 TO  2
          1.9496490699        0.9801569984

   IN ROSBRK DP =
   1      0.7450280D-02       -0.1003710D-01

   P(I) I = 1 TO  2
         1.9719999D 00       9.5004571D-01

   IN ROSBRK N =  2  E(N) =     0.1250000000D-01

     IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)       PENALTY
    400   0.0             0.0           1.0010006D 00  1.0010006D 00
   *FEV*  F =  1.0010006D 00 X =  1.9719999D 00  9.5004571D-01

    NTRIA      N NSTAG NSUCC                U
      22       2    2     0          1.0010006041
   P(I) I = 1 TO  2
          1.9719998504        0.9500457060

   IN ROSBRK DP =
   1       -0.3725140D-02       0.5018549D-02

   P(I) I = 1 TO  2
         1.9608244D 00       9.6510135D-01

   IN ROSBRK N =  2  E(N) =     0.6250000000D-02

     IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)       PENALTY
    400   0.0             0.0           1.0006950D 00  1.0006950D 00
   *FEV*  F =  1.0006950D 00 X =  1.9608244D 00  9.6510135D-01

    NTRIA      N NSTAG NSUCC                U
      23       2    2     1          1.0006950197
   P(I) I = 1 TO  2
          1.9608244302        0.9651013522

   IN ROSBRK DP =
   1       -0.11175 2D-01       0.1505565D-01

   P(I) I = 1 TO  2
         1.9496490D 00       9.8015700D-01
```

```
IN ROSBRK N =  2  E(N) =     0.1875000000D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)         PENALTY
 400  0.0              0.0            1.0010813D 00  1.0010813D 00
*FEV*  F =  1.0010813D 00 X =  1.9496490D 00  9.8015700D-01

 NTRIA      N NSTAG NSUCC                    U
   24       2    2    1            1.0010812682
P(I) I = 1 TO  2
            1.9496490099        0.9801569984

C MATRIX FROM GRAM
            0.7904845805       -0.6124819409
            0.6124819409        0.7904845805

C MATRIX FROM ROSBRK

 7.900D-01 -6.120D-01
 6.120D-01  7.900D-01

 NTRIA      N NSTAG NSUCC                    U
   24       1    3    0            1.0006950197
P(I) I = 1 TO  2
            1.9608244302        0.9651013522

IN ROSBRK DP =
1           0.1195608D 00       0.9263789D-01

P(I) I = 1 TO  2
            2.0803852D 00       1.0577392D 00

IN ROSBRK N =  1  E(N) =     0.15125000000 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)         PENALTY
 400  0.0              0.0            1.0026412D 00  1.0026412D 00
*FEV*  F =  1.0026412D 00 X =  2.0803852D 00  1.0577392D 00

 NTRIA      N NSTAG NSUCC                    U
   25       1    3    0            1.0026412162
P(I) I = 1 TO  2
            2.0803852230        1.0577392458

IN ROSBRK DP =
1           0.5978840D-01       0.4631895D-01

P(I) I = 1 TO  2
            1.9010440D 00       9.1878241D-01

IN ROSBRK N =  1  E(N) =    -0.7562500000D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)         PENALTY
 400  0.0              0.0            1.0042151D 00  1.0042151D 00
*FEV*  F =  1.0042151D 00 X =  1.9010440D 00  9.1878241D-01

 NTRIA      N NSTAG NSUCC                    U
   26       1    3    0            1.0042151389
P(I) I = 1 TO  2
            1.9010440338        0.9187824054
```

```
IN ROSBRK DP =
 1        0.29890200D-01        0.23159470D-01

P(I) I = 1 TO  2
        1.99071460 00          9.88260830D-01

IN ROSBRK N =  1  E(N) =      0.37812500000D-01

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)        PENALTY
 400  0.0              0.0             1.00005830 00   1.00005830 00
*FEV*  F =  1.00005830 00 X =  1.99071460 00   9.88260830D-01

 NTRIA      N NSTAG NSUCC                     U
    27      1     3     1             1.0000582645
P(I) I = 1 TO  2
        1.9907146284          0.9882638256

IN ROSBRK DP =
 1        0.89670590D-01        0.69478420D-01

P(I) I = 1 TO  2
        2.08038520 00          1.05773920 00

IN ROSBRK N =  1  E(N) =      0.11343750000 00

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)        PENALTY
 400  0.0              0.0             1.00264120 00   1.00264120 00
*FEV*  F =  1.00264120 00 X =  2.08038520 00   1.05773920 00

 NTRIA      N NSTAG NSUCC                     U
    28      1     3     1             1.0026412162
P(I) I = 1 TO  2
        2.0803852230          1.0577392458

IN ROSBRK DP =
 1       -0.19140060D-02       0.24702640D-02

P(I) I = 1 TO  2
        1.98880060 00          9.90731090D-01

IN ROSBRK N =  2  E(N) =      0.31250000000D-02

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)        PENALTY
 400  0.0              0.0             1.00005420 00   1.00005420 00
*FEV*  F =  1.00005420 00 X =  1.98880060 00   9.90731090D-01

 NTRIA      N NSTAG NSUCC                     U
    29      2     3     1             1.0000542322
P(I) I = 1 TO  2
        1.9888006223          0.9907310899

IN ROSBRK DP =
 1       -0.57420180D-02       0.74107930D-02

P(I) I = 1 TO  2
        1.98305860 00          9.98141820-01

IN ROSBRK N =  2  E(N) =      0.93750000000D-02
```

```
   IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
  400   0.0                 0.0            1.0001579D 00   1.0001579D 00
 *FEV*   F =   1.0001579D 00  X =   1.98305860 00   9.9814188D-01

  NTRIA       N NSTAG NSUCC                           U
    30        2     3     1              1.0001579304
 P(I)  I = 1  TO   2
           1.9830586041          0.9981412828

 C MATRIX FROM GRAM
           0.7373524153         -0.6755082647
           0.6755082647          0.7373524153

 C MATRIX FROM ROSBRK

  7.37D-01  -6.76D-01
  6.76D-01   7.37D-01

  NTRIA       N NSTAG NSUCC                           U
    30        1     4     0              1.0000542322
 P(I)  I = 1  TO   2
           1.9888006223          0.9907310899

 IN ROSBRK  DP =
 1         0.1394057D-01         0.1277133D-01

 P(I)  I = 1  TO   2
          2.00274120 00         1.00350240 00

 IN ROSBRK  N =   1   E(N) =      0.1890625000D-01

   IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
  400   0.0                 0.0            1.0000052D 00   1.0000052D 00
 *FEV*   F =   1.0000052D 00  X =   2.0027412D 00   1.0035024D 00

  NTRIA       N NSTAG NSUCC                           U
    31        1     4     1              1.0000051626
 P(I)  I = 1  TO   2
           2.0027411914          1.0035024180

 IN ROSBRK  DP =
 1         0.4182171D-01         0.3831398D-01

 P(I)  I = 1  TO   2
          2.04456290 00         1.04181640 00

 IN ROSBRK  N =   1   E(N) =      0.5671875000D-01

   IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
  400   0.0                 0.0            1.0009364D 00   1.0009364D 00
 *FEV*   F =   1.0009364D 00  X =   2.0445629D 00   1.0418164D 00

  NTRIA       N NSTAG NSUCC                           U
    32        1     4     1              1.0009364446
 P(I)  I = 1  TO   2
           2.0445628987          1.0418164024

 IN ROSBRK  DP =
 1        -0.1055482D-02         0.1152113D-02
```

```
P(I) I = 1 TO  2
        2.00168570 00          1.00465450 00

IN ROSBRK N =  2  E(N) =     0.15625000000-02

   IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0                 0.0          1.00000940 00   1.00000940 00
 #FEV#   F =   1.00000940 00 X =   2.00168570 00   1.00465450 00

  NTRIA       N NSTAG NSUCC                             U
    33        2     4     1          1.0000094318
P(I) I = 1 TO  2
        2.0016857097           1.0046545312

IN ROSBRK DP =
1         -0.31664450-02          0.34563390-02

P(I) I = 1 TO  2
        1.99851930 00          1.00811090 00

IN ROSBRK N =  2  E(N) =     0.46875000000-02

   IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0                 0.0          1.00005150 00   1.00005150 00
 #FEV#   F =   1.00005150 00 X =   1.99851930 00   1.00811090 00

  NTRIA       N NSTAG NSUCC                             U
    34        2     4     2          1.0000514943
P(I) I = 1 TO  2
        1.9985192648           1.0081108706

IN ROSBRK DP =
1         -0.94993350-02          0.10369020-01

P(I) I = 1 TO  2
        1.98901990 00          1.01847990 00

IN ROSBRK N =  2  E(N) =     0.14062500000-01

   IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0                 0.0          1.00044100 00   1.00044100 00
 #FEV#   F =   1.00044100 00 X =   1.98901990 00   1.01847990 00

  NTRIA       N NSTAG NSUCC                             U
    35        2     4     2          1.0004409755
P(I) I = 1 TO  2
        1.9890199298           1.0184798890

ROSBRK SEARCH IS COMPLETE.

FINAL PERFORMANCE FUNCTION.  ULAST =      0.10000514940 01
FINAL PARAMETERS ARE
     0.19985192650 01     0.10081108710 01

NUMBER OF TRIALS =    35
NUMBER OF STAGES =     4

   IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0                 0.0          1.00005150 00   1.00005150 00
 #FEV#   F =   1.00005150 00 X =   1.99851930 00   1.00811090 00
```

KRED = -1 ITERM = 0

```
INPUT CARDS READ                                                  18.01.37.40     11/07/68
DATA* CASE  5.0                                                           2241-5  *DATA
DATA*H DAVIDON UNCONSTRAINED OPTIMIZER EXAMPLE                            2241-5  *DATA
DATA* MODE  3 ICOM(1)  1 IREF  2 MOPT  5 A  0.625  -0.75  0.625  -1.75    2241-5  *DATA
DATA* 0.25  2.62F 'PROC  3 ERR  0.0005 ICOM(3)  0 LIMIT  30 FAC  1.0      2241-5  *DATA
DATA* LRED  0 I6   1 DELTA  1.0 IN  2 IONO  1  2 DELX  0.0001  0.0001     2241-5  *DATA
DATA* OVECT  0.0  0.0 NCONS  1 IDC  400 AMULT  1.0 CALOW  0.0 CTP  0.0    2241-5  *DATA
DATA*1                                                                            *DATA
```

DAVIDON UNCONSTRAINED OPTIMIZER EXAMPLE

2241-5

```
VARIABLE METRIC MINIMIZATION
IDENTIFICATION TITLE

N= 2  K= 0  E=   5.000000D-04  P=   0.0          DELTA=   1.000000D 00

X=  0.0          0.0

H

   1.000000D 00   0.0

   0.0            1.000000D 00

  IZ   LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0                 0.0        2.62500000D 00  2.62500000D 00
*FEV*  F =  2.62500000D 00 X =  0.0                 0.-

  IZ   LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0                 0.0        2.62482500D 00  2.62482500D 00
*FEV*  F =  2.62482500D 00 X =  1.00000000D-04  0.0

  IZ   LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0                 0.0        2.62502500D 00  2.62502500D 00
*FEV*  F =  2.62502500D 00 X =  0.0             1.00000000D-04

            PRINT FCN      PASS    1     RANDOM STEP    0     F=      2.625000000 00
          X      0.0                   0.0

          G      -1.749937500 00       2.500625000D-01

IT    0  STEP    0  F=    2.62500D 00

X=    0.0           0.0

- - - - - - - - - -

GS = -3.12481250 00 ERR =   5.00000000D-04 TP1 =   3.36020160 00 IT =        1

  IZ   LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0                 0.0        5.50000000D 00  5.50000000D 00
*FEV*  F =  5.50000000D 00 X =  3.49987500 00 -5.00125000D-01

  IZ   LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0                 0.0        5.50030000D 00  5.50030000D 00
*FEV*  F =  5.50030000D 00 X =  3.49997500 00 -5.00125000D-01

  IZ   LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0                 0.0        5.49970000D 00  5.49970000D 00
*FEV*  F =  5.49970000D 00 X =  3.49987500 00 -5.00025000D-01

            PRINT FCN      PASS    2     RANDOM STEP    0     F=      5.500000010 00
          X      3.499875000 00        -5.001250000D-01

          G      3.000000000 00        -3.000000000 00

  IZ   LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0                 0.0        1.55483670 00   1.55483670 00
*FEV*  F =  1.55483670 00 X =  1.19858860 00 -1.71275870-01
```

```
  IZ     LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
 400    0.0                   0.0             1.55482440 00   1.55482440 00
*FEV*   F =  1.55482440 00 X =   1.11868860 00 -1.71275870-01

  IZ     LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
 400    0.0                   0.0             1.55475040 00   1.55475040 00
*FEV*   F =  1.55475040 00 X =   1.19858860 00 -1.71175870-01

          PRINT FCN       PASS      3      RANDOM STEP     0       F=        1.554836740 00
          X       1.198588620 00         -1.712758700-01

          G       -1.232448200-01         -8.629738040-01

IT     1   STEP      0  F=      1.554840 00   SS=    -3.124810 00

X=    1.198590 00   -1.712760-01

ERROR MATRIX

   9.900810-01     3.701300-01

   3.701300-01     6.948240-01

DELTA=     5.509350-01

- - - - - - - - - -
GS =  -6.11222340-01 ERR =   5.00000000-04 TP1 =   1.01752610 01  IT =        2

  IZ     LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
 400    0.0                   0.0             1.00574400 00   1.00574400 00
*FEV*   F =  1.00574400 00 X =   2.08145870 00   1.11918680 00

  IZ     LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
 400    0.0                   0.0             1.00574530 00   1.00574530 00
*FEV*   F =  1.00574530 00 X =   2.08155870 00   1.11918680 00

  IZ     LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
 400    0.0                   0.0             1.00575280 00   1.00575280 00
*FEV*   F =  1.00575280 00 X =   2.08145870 00   1.11928680 00

          PRINT FCN       PASS      4      RANDOM STEP     0       F=        1.005744030 00
          X       2.081458720 00          1.119186830 00

          G        1.249578360-02          8.795199310-02

  IZ     LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
 400    0.0                   0.0             1.00000000 00   1.00000000 00
*FEV*   F =  1.00000000 00 X =   1.99988020 00   9.99946130-01

  IZ     LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
 400    0.0                   0.0             1.00000000 00   1.00000000 00
*FEV*   F =  1.00000000 00 X =   1.99998020 00   9.99946130-01

  IZ     LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
 400    0.0                   0.0             1.00000000 00   1.00000000 00
*FEV*   F =  1.00000000 00 X =   1.99988020 00   1.00004610 00

          PRINT FCN       PASS      5      RANDOM STEP     0       F=        1.000000010 00
          X       1.999880200 00          9.999461340-01
```

```
      G      -4.685240640-05       8.501853440-05

 COLINEAR

 IT    2  STEP    0  F=   1.000000D 00  GS=  -6.112220-01

 X=   1.999880 00    9.999460-01

 ERROR MATRIX

    1.249940 00   7.499620-01

    7.499620-01   1.250010 00

 DELTA=   1.000000 00

 - - - - - - - - - - -

 FINAL VALUES

 ERROR MATRIX

    1.249940 00   7.499620-01

    7.499620-01   1.250010 00

 F=   1.000000D 00  GS=  -5.804400-09

 X=   1.999880 00    9.999460-01

 G=  -4.685240-05    8.501850-05

   IZ     LOWER BOUND      UPPER BOUND      OCCUR(IZ)        PENALTY
  400   0.0              0.0          1.00000000 00   1.00000000 00
 *FEY*  F =  1.00000000 00 X =   1.99988020 00   9.99946130-01

          PRINT FCN      PASS     6      RANDOM STEP     0      F=        1.00000001D 00
           X       1.999880200 00         9.999461340-01

           G       -4.685240640-05         8.501853440-05

 KRED =     -1  ITERM =      0
```

```
INPUT CARDS READ                                              18.01.38.47     11/07/68
DATA* CASE  6.0                                                      2241-6   *DATA
DATA*H TWO-VARIABLE FIBONACCI EXAMPLE                                2241-6   *DATA
DATA* MODE  3 ICOM(1)  1 TREF  2 MOPT  5 A  0.625  -0.75  0.625  -1.75   2241-6   *DATA
DATA* 0.25  2.625 IPROC  5 ICOM(3)  0 LIMIT  12 LRED  0 IEX  1 IN  2     2241-6   *DATA
DATA* IDNO  1  2 ALOW  -10.0  -10.0 UP  10.0  10.0 NCONS  1 IDC  400     2241-6   *DATA
DATA* AMULT  1.0 CALOW  0.0 CTP  0.0                                 2241-6   *DATA
DATA*1                                                                        *DATA
```

TWO-VARIABLE FIBONACCI EXAMPLE 2241-5

```
  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)           PENALTY
  400  0.0              0.0            8.9526671D 00  8.9526671D 00
*FEV*  F =  8.9526671D 00 X = -2.3607427D 00 -2.3607427D 00

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)           PENALTY
  400  0.0              0.0            9.0497268D 00  9.0497268D 00
*FEV*  F =  9.0497268D 00 X =  2.3607427D 00 -2.3607427D 00

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)           PENALTY
  400  0.0              0.0            2.2823693D 01  2.2823693D 01
*FEV*  F =  2.2823693D 01 X = -5.2785146D 00 -2.3607427D 00

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)           PENALTY
  400  0.0              0.0            5.7004807D 00  5.7004807D 00
*FEV*  F =  5.7004807D 00 X = -5.5702918D-01 -2.3607427D 00

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)           PENALTY
  400  0.0              0.0            5.7233825D 00  5.7233825D 00
*FEV*  F =  5.7233825D 00 X =  5.5702918D-01 -2.3607427D 00

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)           PENALTY
  400  0.0              0.0            6.4637662D 00  6.4637662D 00
*FEV*  F =  6.4637662D 00 X = -1.2466844D 00 -2.3607427D 00

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)           PENALTY
  400  0.0              0.0            5.5262728D 00  5.5262728D 00
*FEV*  F =  5.5262728D 00 X = -1.3262599D-01 -2.3607427D 00

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)           PENALTY
  400  0.0              0.0            5.5317256D 00  5.5317256D 00
*FEV*  F =  5.5317256D 00 X =  1.3262599D-01 -2.3607427D 00

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)           PENALTY
  400  0.0              0.0            5.5652163D 00  5.5652163D 00
*FEV*  F =  5.5652163D 00 X = -2.9177719D-01 -2.3607427D 00

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)           PENALTY
  400  0.0              0.0            5.5179001D 00  5.5179001D 00
*FEV*  F =  5.5179001D 00 X = -2.6525199D-02 -2.3607427D 00

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)           PENALTY
  400  0.0              0.0            5.5189907D 00  5.5189907D 00
*FEV*  F =  5.5189907D 00 X =  2.6525199D-02 -2.3607427D 00

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)           PENALTY
  400  0.0              0.0            5.5203275D 00  5.5203275D 00
*FEV*  F =  5.5203275D 00 X = -7.9575557D-02 -2.3607427D 00

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)           PENALTY
  400  0.0              0.0            1.8492698D 01  1.8492698D 01
*FEV*  F =  1.8492698D 01 X = -2.3607427D 00  2.3607427D 00

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)           PENALTY
  400  0.0              0.0            1.8704390D 00  1.8704390D 00
*FEV*  F =  1.8704390D 00 X =  2.3607427D 00  2.3607427D 00

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)           PENALTY
  400  0.0              0.0            5.5292630D 00  5.5292630D 00
```

```
*FEV*  F =  5.529[illegible]630D 00 X =  5.2785146D 00  2.3607427D 00

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)        PENALTY
 400  0.0              0.0          4.9312500D 00  4.9312500D 00
*FEV*  F =  4.9312500D 00 X =  5.5702918D-01  2.3607427D 00

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)        PENALTY
 400  0.0              0.0          2.0115432D 00  2.0115432D 00
*FEV*  F =  2.0115432D 00 X =  3.4748011D 00  2.3607427D 00

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)        PENALTY
 400  0.0              0.0          2.5605515D 00  2.5605515D 00
*FEV*  F =  2.5605515D 00 X =  1.6710875D 00  2.3607427D 00

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)        PENALTY
 400  0.0              0.0          1.7412606D 00  1.7412606D 00
*FEV*  F =  1.7412606D 00 X =  2.7851459D 00  2.3607427D 00

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)        PENALTY
 400  0.0              0.0          1.7748568D 00  1.7748568D 00
*FEV*  F =  1.7748568D 00 X =  3.0503979D 00  2.3607427D 00

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)        PENALTY
 400  0.0              0.0          1.7633180D 00  1.7633180D 00
*FEV*  F =  1.7633180D 00 X =  2.6259947D 00  2.3607427D 00

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)        PENALTY
 400  0.0              0.0          1.7441453D 00  1.7441453D 00
*FEV*  F =  1.7441453D 00 X =  2.8912467D 00  2.3607427D 00

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)        PENALTY
 400  0.0              0.0          1.7450951D 00  1.7450951D 00
*FEV*  F =  1.7450951D 00 X =  2.7320955D 00  2.3607427D 00

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)        PENALTY
 400  0.0              0.0          1.7409440D 00  1.7409440D 00
*FEV*  F =  1.7409440D 00 X =  2.8381963D 00  2.3607427D 00

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)        PENALTY
 400  0.0              0.0          3.8319228D 01  3.8319228D 01
*FEV*  F =  3.8319228D 01 X = -2.3607427D 00  5.2785146D 00

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)        PENALTY
 400  0.0              0.0          1.1364807D 01  1.1364807D 01
*FEV*  F =  1.1364807D 01 X =  2.3607427D 00  5.2785146D 00

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)        PENALTY
 400  0.0              0.0          8.6385862D 00  8.6385862D 00
*FEV*  F =  8.6385862D 00 X =  5.2785146D 00  5.2785146D 00

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)        PENALTY
 400  0.0              0.0          1.2275916D 01  1.2275916D 01
*FEV*  F =  1.2275916D 01 X =  7.0822281D 00  5.2785146D 00

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)        PENALTY
 400  0.0              0.0          8.4236055D 00  8.4236055D 00
*FEV*  F =  8.4236055D 00 X =  4.1644562D 00  5.2785146D 00

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)        PENALTY
 400  0.0              0.0          9.0679849D 00  9.0679849D 00
```

```
*FEV*  F =  9.06798490 00 X =  3.47480110 00  5.27851460 00

IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
400   0.0            0.0             8.32257050 00   8.32257050 00
*FEV*  F =  8.32257050 00 X =  4.58885940 00  5.27851460 00

IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
400   0.0            0.0             8.37375640 00   8.37375640 00
*FEV*  F =  8.37375640 00 X =  4.85411140 00  5.27851460 00

IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
400   0.0            0.0             8.33407420 00   8.33407420 00
*FEV*  F =  8.33407420 00 X =  4.42970820 00  5.27851460 00

IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
400   0.0            0.0             8.33249110 00   8.33249110 00
*FEV*  F =  8.33249110 00 X =  4.69496020 00  5.27851460 00

IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
400   0.0            0.0             8.32288710 00   8.32288710 00
*FEV*  F =  8.32288710 00 X =  4.53580900 00  5.27851460 00

IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
400   0.0            0.0             8.32577180 00   8.32577180 00
*FEV*  F =  8.32577180 00 X =  4.64190980 00  5.27851460 00

IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
400   0.0            0.0             1.15589260 01   1.15589260 01
*FEV*  F =  1.15589260 01 X = -2.36074270 00  5.57029180-01

IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
400   0.0            0.0             1.32382290 00   1.32382290 00
*FEV*  F =  1.32382290 00 X =  2.36074270 00  5.57029180-01

IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
400   0.0            0.0             8.92976540 00   8.92976540 00
*FEV*  F =  8.92976540 00 X =  5.27851460 00  5.57029180-01

IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
400   0.0            0.0             1.94459700 00   1.94459700 00
*FEV*  F =  1.94459700 00 X =  5.57029180-01  5.57029180-01

IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
400   0.0            0.0             2.97200870 00   2.97200870 00
*FEV*  F =  2.97200870 00 X =  3.47480110 00  5.57029180-01

IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
400   0.0            0.0             1.08098010 00   1.08098010 00
*FEV*  F =  1.08098010 00 X =  1.67108750 00  5.57029180-01

IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
400   0.0            0.0             1.22704460 00   1.22704460 00
*FEV*  F =  1.22704460 00 X =  1.24668440 00  5.57029180-01

IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
400   0.0            0.0             1.10402260 00   1.10402260 00
*FEV*  F =  1.10402260 00 X =  1.93633950 00  5.57029180-01

IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
400   0.0            0.0             1.10936980 00   1.10936980 00
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*FEV*  F =  1.1096980D 00 X =  1.5115363D 00  5.5702918D-01

  IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)           PENALTY
 400   0.0               0.0              1.0796433D 00   1.0796433D 00
*FEV*  F =  1.0796433D 00 X =  1.7771883D 00  5.5702918D-01

  IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)           PENALTY
 400   0.0               0.0              1.0842518D 00   1.0842518D 00
*FEV*  F =  1.0842518D 00 X =  1.8302387D 00  5.5702918D-01

  IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)           PENALTY
 400   0.0               0.0              1.0785528D 00   1.0785528D 00
*FEV*  F =  1.0785528D 00 X =  1.7241379D 00  5.5702918D-01

  IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)           PENALTY
 400   0.0               0.0              9.3079078D 00   9.3079078D 00
*FEV*  F =  9.3079078D 00 X = -2.3607427D 00 -5.5702918D-01

  IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)           PENALTY
 400   0.0               0.0              3.0178122D 00   3.0178122D 00
*FEV*  F =  3.0178122D 00 X =  2.3607427D 00 -5.5702918D-01

  IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)           PENALTY
 400   0.0               0.0              1.3061681D 01   1.3061681D 01
*FEV*  F =  1.3061681D 01 X =  5.2785146D 00 -5.5702918D-01

  IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)           PENALTY
 400   0.0               0.0              2.1315047D 00   2.1315047D 00
*FEV*  F =  2.1315047D 00 X =  5.5702918D-01 -5.5702918D-01

  IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)           PENALTY
 400   0.0               0.0              3.6156845D 00   3.6156845D 00
*FEV*  F =  3.6156845D 00 X = -5.5702918D-01 -5.5702918D-01

  IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)           PENALTY
 400   0.0               0.0              1.9901894D 00   1.9901894D 00
*FEV*  F =  1.9901894D 00 X =  1.2466844D 00 -5.5702918D-01

  IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)           PENALTY
 400   0.0               0.0              2.1987323D 00   2.1987323D 00
*FEV*  F =  2.1987323D 00 X =  1.6710875D 00 -5.5702918D-01

  IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)           PENALTY
 400   0.0               0.0              1.9741828D 00   1.9741828D 00
*FEV*  F =  1.9741828D 00 X =  9.8143236D-01 -5.5702918D-01

  IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)           PENALTY
 400   0.0               0.0              2.0067940D 00   2.0067940D 00
*FEV*  F =  2.0067940D 00 X =  8.2228117D-01 -5.5702918D-01

  IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)           PENALTY
 400   0.0               0.0              1.9700316D 00   1.9700316D 00
*FEV*  F =  1.9700316D 00 X =  1.0875331D 00 -5.5702918D-01

  IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)           PENALTY
 400   0.0               0.0              1.9732329D 00   1.9732329D 00
*FEV*  F =  1.9732329D 00 X =  1.1405836D 00 -5.5702918D-01

  IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)           PENALTY
 400   0.0               0.0              1.9703482D 00   1.9703482D 00
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*FEV*  F =  1.97034820 00 X =  1.03448280 00 -5.57029180-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0           1.37298770 01  1.37298770 01
*FEV*  F =  1.37298770 01 X = -2.36074270 00  1.24668440 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0           1.05262560 00  1.05262560 00
*FEV*  F =  1.05262560 00 X =  2.36074270 00  1.24668440 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0           7.14937570 00  7.14937570 00
*FEV*  F =  7.14937570 00 X =  5.27851460 00  1.24668440 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0           2.60635500 00  2.60635500 00
*FEV*  F =  2.60635500 00 X =  5.57029180-01  1.24668440 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0           2.12457430 00  2.12457430 00
*FEV*  F =  2.12457430 00 X =  3.47480110 00  1.24668440 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0           1.16650100 00  1.16650100 00
*FEV*  F =  1.16650100 00 X =  1.67108750 00  1.24668440 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0           1.27805460 00  1.27805460 00
*FEV*  F =  1.27805460 00 X =  2.78514590 00  1.24668440 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0           1.02606520 00  1.02606520 00
*FEV*  F =  1.02606520 00 X =  2.09549070 00  1.24668440 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0           1.05234420 00  1.05234420 00
*FEV*  F =  1.05234420 00 X =  1.93633950 00  1.24668440 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0           1.02613560 00  1.02613560 00
*FEV*  F =  1.02613560 00 X =  2.20159150 00  1.24668440 0

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0           1.03130690 00  1.03130690 00
*FEV*  F =  1.03130690 00 X =  2.04244030 00  1.24668440 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0           1.02434140 00  1.02434140 00
*FEV*  F =  1.02434140 00 X =  2.14854110 00  1.24668440 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0           1.53613520 01  1.53613520 01
*FEV*  F =  1.53613520 01 X = -2.36074270 00  1.67108750 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0           1.18124120 00  1.18124120 00
*FEV*  F =  1.18124120 00 X =  2.36074270 00  1.67108750 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0           6.34925750 00  6.34925750 00
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*FEV*  F =  6.3492575D 00 X =  [illegible]7851460 00  1.6710875D 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0             3.3090968D 00  3.3090968D 00
*FEV*  F =  3.3090968D 00 X =  5.5702918D-01  1.6710875D 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0             1.8985824D 00  1.8985824D 00
*FEV*  F =  1.8985824D 00 X =  3.4748011D 00  1.6710875D 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0             1.5146355D 00  1.5146355D 00
*FEV*  F =  1.5146355D 00 X =  1.6710875D 00  1.6710875D 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0             1.2715816D 00  1.2715816D 00
*FEV*  F =  1.2715816D 00 X =  2.7851459D 00  1.6710875D 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0             1.2391111D 00  1.2391111D 00
*FEV*  F =  1.2391111D 00 X =  2.0954907D 00  1.6710875D 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0             1.1887344D 00  1.1887344D 00
*FEV*  F =  1.1887344D 00 X =  2.5198939D 00  1.6710875D 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0             1.1938354D 00  1.1938354D 00
*FEV*  F =  1.1938354D 00 X =  2.2546419D 00  1.6710875D 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0             1.1802210D 00  1.1802210D 00
*FEV*  F =  1.1802210D 00 X =  2.4137931D 00  1.6710875D 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0             1.1827187D 00  1.1827187D 00
*FEV*  F =  1.1827187D 00 X =  2.4668435D 00  1.6710875D 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0             1.2824537D 01  1.2824537D 01
*FEV*  F =  1.2824537D 01 X = -2.3607427D 00  9.8143236D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0             1.0865736D 00  1.0865736D 00
*FEV*  F =  1.0865736D 00 X =  2.3607427D 00  9.8143236D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0             7.7637824D 00  7.7637824D 00
*FEV*  F =  7.7637824D 00 X =  5.2785146D 00  9.8143236D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0             2.2814740D 00  2.2814740D 00
*FEV*  F =  2.2814740D 00 X =  5.5702918D 01  9.8143236D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0             2.3801520D 00  2.3801520D 00
*FEV*  F =  2.3801520D 00 X =  3.4748011D 00  9.8143236D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
  400  0.0               0.0             1.0632498D 00  1.0632498D 00
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*FEV*  F =  1.06324980 00 X =  1.67108750 00  9.81432360-01

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0            0.0             1.34440280 00   1.34440280 00
*FEV*  F =  1.34440280 00 X =  1.24668440 00  9.81432360-01

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0            0.0             1.00186190 00   1.00186190 00
*FEV*  F =  1.00186190 00 X =  1.93633950 00  9.81432360-01

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0            0.0             1.00724430 00   1.00724430 00
*FEV*  F =  1.00724430 00 X =  2.09549070 00  9.81432360-01

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0            0.0             1.01586320 00   1.01586320 00
*FEV*  F =  1.01586320 00 X =  1.83023670 00  9.81432360-01

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0            0.0             1.00013810 00   1.00013810 00
*FEV*  F =  1.00013810 00 X =  1.98938990 00  9.81432360-01

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0            0.0             1.00193220 00   1.00193220 00
*FEV*  F =  1.00193220 00 X =  2.04244030 00  9.81432360-01

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0            0.0             1.23235490 01   1.23235490 01
*FEV*  F =  1.23235490 01 X = -2.36074270 00  8.22281170-01

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0            0.0             1.14915760 00   1.14915760 00
*FEV*  F =  1.14915760 00 X =  2.36074270 00  8.22281170-01

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0            0.0             8.17464150 00   8.17464150 00
*FEV*  F =  8.17464150 00 X =  5.27851460 00  8.22281170-01

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0            0.0             2.12876070 00   2.12876070 00
*FEV*  F =  2.12876070 00 X =  5.57029180-01  8.22281170-01

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0            0.0             2.57571380 00   2.57571380 00
*FEV*  F =  2.57571380 00 X =  3.47480110 00  8.22281170-01

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0            0.0             1.04351420 00   1.04351420 00
*FEV*  F =  1.04351420 00 X =  1.67108750 00  8.22281170-01

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0            0.0             1.27400900 00   1.27400900 00
*FEV*  F =  1.27400900 00 X =  1.24668440 00  8.22281170-

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0            0.0             1.01378770 00   1.01378770 00
*FEV*  F =  1.01378770 00 X =  1.93633950 00  8.22281170-01

  IZ    LOWER BOUND    UPPER BOUND        OCCUR(IZ)          PENALTY
  400   0.0            0.0             1.03816690 00   1.03816690 00
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*FEV*  F =  1.0381669D 00 X =  2.0954907D 00  8.2228117D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)           PENALTY
  400  0.0               0.0            1.01512450 00   1.01512450 00
*FEV*  F =  1.01512450 00 X =  1.83023870 00  8.22281170-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)           PENALTY
  400  0.0               0.0            1.01839610 00   1.01839610 00
*FEV*  F =  1.01839610 00 X =  1.98938990 00  8.22281170-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)           PENALTY
  400  0.0               0.0            1.01269710 00   1.01269710 00
*FEV*  F =  1.01269710 00 X =  1.88328910 00  8.22281170-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)           PENALTY
  400  0.0               0.0            1.31761190 01   1.31761190 01
*FEV*  F =  1.31761190 01 X = -2.36074270 00  1.08753320 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)           PENALTY
  400  0.0               0.0            1.06244060 00   1.06244060 00
*FEV*  F =  1.06244060 00 X =  2.36074270 00  1.08753320 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)           PENALTY
  400  0.0               0.0            7.50746590 00   7.50746590 00
*FEV*  F =  7.50746590 00 X =  5.27851460 00  1.08753320 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)           PENALTY
  400  0.0               0.0            2.40087260 00   2.40087260 00
*FEV*  F =  2.40087260 00 X =  5.57029180-01  1.08753320 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)           PENALTY
  400  0.0               0.0            2.26736710 00   2.26736710 00
*FEV*  F =  2.26736710 00 X =  3.47480110 00  1.08753320 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)           PENALTY
  400  0.0               0.0            1.09399650 00   1.09399650 00
*FEV*  F =  1.09399650 00 X =  1.67108750 00  1.08753320 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)           PENALTY
  400  0.0               0.0            1.33852790 00   1.33852790 00
*FEV*  F =  1.33852790 00 X =  2.78514590 00  1.08753320 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)           PENALTY
  400  0.0               0.0            1.00421890 00   1.00421890 00
*FEV*  F =  1.00421890 00 X =  2.09549070 00  1.08753320 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)           PENALTY
  400  0.0               0.0            1.01150100 00   1.01150100 00
*FEV*  F =  1.01150100 00 X =  1.93633950 00  1.08753320 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)           PENALTY
  400  0.0               0.0            1.01695380 00   1.01695380 00
*FEV*  F =  1.01695380 00 X =  2.20159150 00  1.08753320 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)           PENALTY
  400  0.0               0.0            1.00312830 00   1.00312830 00
*FEV*  F =  1.00312830 00 X =  2.04244030 00  1.08753320 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)           PENALTY
  400  0.0               0.0            1.00555570 00   1.00555570 00
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*FEV*  F =  1.0055557D 00 X =  1.9893899D 00   1.0875332D 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
 400   0.0               0.0             1.2654023D 01  1.2654023D 01
*FEV*  F =  1.2654023D 01 X = -2.3607427D 00   9.2838196D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
 400   0.0               0.0             1.1039170D 00  1.1039170D 00
*FEV*  F =  1.1039170D 00 X =  2.3607427D 00   9.2838196D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
 400   0.0               0.0             7.8972175D 00  7.8972175D 00
*FEV*  F =  7.8972175D 00 X =  5.2785146D 00   9.2838196D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
 400   0.0               0.0             2.2270517D 00  2.2270517D 00
*FEV*  F =  2.2270517D 00 X =  5.5702918D-01   9.2838196D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
 400   0.0               0.0             2.4418213D 00  2.4418213D 00
*FEV*  F =  2.4418213D 00 X =  3.4748011D 00   9.2838196D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
 400   0.0               0.0             1.0531533D 00  1.0531533D 00
*FEV*  F =  1.0531533D 00 X =  1.6710875D 00   9.2838196D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
 400   0.0               0.0             1.3174203D 00  1.3174203D 00
*FEV*  F =  1.3174203D 00 X =  1.2466844D 00   9.2838196D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
 400   0.0               0.0             1.0023192D 00  1.0023192D 00
*FEV*  F =  1.0023192D 00 X =  1.9363395D 00   9.2838196D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
 400   0.0               0.0             1.0140339D 00  1.0140339D 00
*FEV*  F =  1.0140339D 00 X =  2.0954907D 00   9.2838196D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
 400   0.0               0.0             1.0120990D 00  1.0120990D 00
*FEV*  F =  1.0120990D 00 X =  1.8302387D 00   9.2838196D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
 400   0.0               0.0             1.0027062D 00  1.0027062D 00
*FEV*  F =  1.0027062D 00 X =  1.9893899D 00   9.2838196D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
 400   0.0               0.0             1.0054502D 00  1.0054502D 00
*FEV*  F =  1.0054502D 00 X =  1.8832891D 00   9.2838196D-01

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
 400   0.0               0.0             1.2998569D 01  1.2998569D 01
*FEV*  F =  1.2998569D 01 X = -2.3607427D 00   1.0344828D 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
 400   0.0               0.0             1.0727482D 00  1.0727482D 00
*FEV*  F =  1.0727482D 00 X =  2.3607427D 00   1.0344828D 00

  IZ     LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
 400   0.0               0.0             7.6338652D 00  7.6338652D 00
```

```
*FEV*  F =  7.63386520 00 X =  5.2785146. 00  1.03448280 00

   IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)        PENALTY
  400  0.0             0.0            2.33941440 00  2.33941440 00
*FEV*  F =  2.33941440 00 X =  5.57029180-01  1.03448280 00

   IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)        PENALTY
  400  0.0             0.0            2.32200060 00  2.32200060 00
*FEV*  F =  2.32200060 00 X =  3.47480110 00  1.03448280 00

   IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)        PENALTY
  400  0.0             0.0            1.07686420 00  1.07686420 00
*FEV*  F =  1.07686420 00 X =  1.67108750 00  1.03448280 00

   IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)        PENALTY
  400  0.0             0.0            1.36572150 00  1.36572150 00
*FEV*  F =  1.36572150 00 X =  2.78514590 00  1.03448280 00

   IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)        PENALTY
  400  0.0             0.0            1.00397260 00  1.00397260 00
*FEV*  F =  1.00397260 00 X =  2.09549070 00  1.03448280 00

   IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)        PENALTY
  400  0.0             0.0            1.00492250 00  1.00492250 00
*FEV*  F =  1.00492250 00 X =  1.93633950 00  1.03448280 00

   IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)        PENALTY
  400  0.0             0.0            1.02092910 00  1.02092910 00
*FEV*  F =  1.02092910 00 X =  2.20159150 00  1.03448280 00

   IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)        PENALTY
  400  0.0             0.0            1.00077130 00  1.00077130 00
*FEV*  F =  1.00077130 00 X =  2.04244030 00  1.03448280 00

   IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)        PENALTY
  400  0.0             0.0            1.00108790 00  1.00108790 00
*FEV*  F =  1.00108790 00 X =  1.98938990 00  1.03448280 00

   IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)        PENALTY
  400  0.0             0.0            1.00013810 00  1.00013810 00
*FEV*  F =  1.00013810 00 X =  1.98938990 00  9.81432360-01

KRED =     -1 ITERM =       0
```

```
INPUT CARDS READ                                                              18.01.42.46      11/07/68
DATA* CASE  7.0                                                                          2241-7  *DATA
DATA*H ROSENBROCK DESIGN VARIABLE OPTIMIZER, CONSTRAINED                                 2241-7  *DATA
DATA* MODE  3 ICOM(1)  1 IREF  2 MOPT  5 A  0.625  -0.75  0.625  -1.75  0.25 2241-7  *DATA
DATA* 2.625 IPROC  4 ICOM(3)  0 LIMIT  200 LRED  20 IEX  2 IN  2                         2241-7  *DATA
DATA* IDNO  1  2 DELX  0.01  0.01 OVECT  1.0  2.0 NCONS  2 IDC  2  400                   2241-7  *DATA
DATA* AMULT  1.0  1.0 CALOW  -10.0  0.0 CTP  2.5  1.1                                    2241-7  *DATA
DATA* WRF  0.0                                                                           2241-7  *DATA
DATA*1                                                                                           *DATA
```

```
   IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
    2 -1.00000000 01  2.50000000 00  2.00000000 00  0.0
  400  0.0            1.10000000 00  3.00000000 00  3.61000000 00
 #FEV#  F =  3.61000000 00 X =  1.00000000 00  2.00000000 00

   NTRIA       N NSTAG NSUCC                   U
     1       1     0     0          3.61000000000
  P(I) I = 1 TO  2
          1.0000000000        2.0000000000

   IN ROSBRK  DP =
 1         0.10000000D-01        0.0

  P(I) I = 1 TO  2
          1.01000000 00        2.00000000 00

   IN ROSBRK  N =   1   E(N) =      0.10000000000-01

   IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
    2 -1.00000000 01  2.50000000 00  2.00000000 00  0.0
  400  0.0            1.10000000 00  2.98006250 00  3.53463500 00
 #FEV#  F =  3.53463500 00 X =  1.01000000 00  2.00000000 00

   NTRIA       N NSTAG NSUCC                   U
     2       1     0     1          3.5346350039
  P(I) I = 1 TO  2
          1.0100000000        2.0000000000

   IN ROSBRK  DP =
 1         0.30000000D-01        0.0

  P(I) I = 1 TO  2
          1.04000000 00        2.00000000 00

   IN ROSBRK  N =   1   E(N) =      0.30000000000-01

   IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
    2 -1.00000000 01  2.50000000 00  2.00000000 00  0.0
  400  0.0            1.10000000 00  2.92100000 00  3.31604100 00
 #FEV#  F =  3.31604100 00 X =  1.04000000 00  2.00000000 00

   NTRIA       N NSTAG NSUCC                   U
     3       1     0     2          3.3160410000
  P(I) I = 1 TO  2
          1.0400000000        2.0000000000

   IN ROSBRK  DP =
 1         0.90000000D-01        0.0

  P(I) I = 1 TO  2
          1.13000000 00        2.00000000 00

   IN ROSBRK  N =   1   E(N) =      0.90000000000-01

   IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
    2 -1.00000000 01  2.50000000 00  2.00000000 00  0.0
  400  0.0            1.10000000 00  2.75056250 00  2.72435660 00
 #FEV#  F =  2.72435660 00 X =  1.13000000 00  2.00000000 00
```

```
NTRIA     N NSTAG NSUCC              U
    4     1    0     3         2.7243565664
P(I) I = 1 TO  2
          1.1300000000        2.0000000000

IN ROSBRK DP =
1       0.27000000 00        0.0

P(I) I = 1 TO  2
          1.40000000 00       2.00000000 00

IN ROSBRK N =   1  E(N) =     0.27000000000 00

  IZ    LOWER BOUND      UPPER BOUND        OECUR(IZ)          PENALTY
   2 -1.00000000D 01  2.50000000D 00  2.00000000D 00  0.0
 400  0.0             1.10000000 00   2.30000000D 00  1.44000000 00
*FEV*  F =  1.44000000 00 X =  1.40000000 00   2.00000000D 00

NTRIA     N NSTAG NSUCC              U
    5     1    0     4         1.4400000000
P(I) I = 1 TO  2
          1.4000000000        2.0000000000

IN ROSBRK DP =
1       0.81000000 00        0.0

P(I) I = 1 TO  2
          2.21000000 00       2.00000000 00

IN ROSBRK N =   1  E(N) =     0.81000000000 00

  IZ    LOWER BOUND      UPPER BOUND        OECUR(IZ)          PENALTY
   2 -1.00000000D 01  2.50000000D 00  2.00000000D 00  0.0
 400  0.0             1.10000000 00   1.49506250 00   1.56074380-01
*FEV*  F =  1.56074380-01 X =  2.21000000 00   2.00000000D 00

NTRIA     N NSTAG NSUCC              U
    6     1    0     5         0.1560743789
P(I) I = 1 TO  2
          2.2100000000        2.0000000000

IN ROSBRK DP =
1       0.24300000 01        0.0

P(I) I = 1 TO  2
          4.64000000 00       2.00000000 00

IN ROSBRK N =   1  E(N) =     0.24300000000 01

  IZ    LOWER BOUND      UPPER BOUND        OECUR(IZ)          PENALTY
   2 -1.00000000D 01  2.50000000D 00  2.00000000D 00  0.0
 400  0.0             1.10000000 00   4.00100000 00   8.41580100 00
*FEV*  F =  8.41580100 00 X =  4.64000000 00   2.00000000 00

NTRIA     N NSTAG NSUCC              U
    7     1    0     5         8.4158010000
P(I) I = 1 TO  2
          4.6400000000        2.0000000000
```

```
IN ROSBRK DP =
 1        0.0                 0.10000000D-01

 P(I) I = 1 TO  2
       2.21000000 00        2.01000000 00

 IN ROSBRK N =  2  E(N) =     0.10000000000D-01

    IZ     LOWER BOUND     UPPER BOUND       OCCUR (IZ)          PENALTY
     2  -1.00000000 01   2.50000000 00   2.01000000 00   0.0
   400   0.0             1.10000000 00   1.50605000 00   1.64876600-01
 *FEV*  F =  1.64876600-01  X =  2.21000000 00   2.01000000 00

 NTRIA      N NSTAG NSUCC                U
    8       2    0     0         0.1648766025
 P(I) I = 1 TO  2
       2.2100000000         2.0100000000

 IN ROSBRK DP =
 1        0.0                -0.50000000D-02

 P(I) I = 1 TO  2
       2.21000000 00        1.99500000 00

 IN ROSBRK N =  2  E(N) =    -0.50000000000D-02

    IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)           PENALTY
     2  -1.00000000 01   2.50000000 00   1.99500000 00   0.0
   400   0.0             1.10000000 00   1.48961560 00   1.51800340-01
 *FEV*  F =  1.51800340-01  X =  2.21000000 00   1.99500000 00

 NTRIA      N NSTAG NSUCC                U
    9       2    0     1         0.1518003352
 P(I) I = 1 TO  2
       2.2100000000         1.9950000000

 IN ROSBRK DP =
 1        0.0                -0.15000000D-01

 P(I) I = 1 TO  2
       2.21000000 00        1.98000000 00

 IN ROSBRK N =  2  F(N) =    -0.15000000000D-01

    IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)           PENALTY
     2  -1.00000000 01   2.50000000 00   1.98000000 00   0.0
   400   0.0             1.10000000 00   1.47346250 00   1.39474240-01
 *FEV*  F =  1.39474240-01  X =  2.21000000 00   1.98000000 00

 NTRIA      N NSTAG NSUCC                U
   10       2    0     2         0.1394742389
 P(I) I = 1 TO  2
       2.2100000000         1.9800000000

 IN ROSBRK DP =
 1        0.0                -0.45000000D-01

 P(I) I = 1 TO  2
       2.21000000 00        1.93500000 00
```

```
IN ROSBRK N =  2  E(N) =   -0.4500000000D-01

   IZ    LOWER BOUND    UPPER BOUND       OCCUR(IZ)          PENALTY
    2 -1.00000000D 01  2.50000000D 00  1.93500000D 00  0.0
  400  0.0             1.10000000D 00  1.42669060D 00  1.06726760D-01
 *FEV* F =  1.06726760D-01 X =  2.21000000D 00  1.93500000D 00

   NTRIA     N NSTAG NSUCC              U
    11       2    0    3        0.1067267645
 P(I) I = 1 TO  2
        2.2100000000         1.9350000000

 IN ROSBRK DP =
 1        0.0                  -0.13500000D 00

 P(I) I = 1 TO  2
        2.21000000D 00       1.80000000D 00

 IN ROSBRK N =  2  E(N) =   -0.1350000000D 00

   IZ    LOWER BOUND    UPPER BOUND       OCCUR(IZ)          PENALTY
    2 -1.00000000D 01  2.50000000D 00  1.80000000D 00  0.0
  400  0.0             1.10000000D 00  1.30156250D 00  4.06274410D-02
 *FEVA  F =  4.06274410D-02 X =  2.21000000D 00  1.80000000D 00

   NTRIA     N NSTAG NSUCC              U
    12       2    0    4        0.0406274414
 P(I) I = 1 TO  2
        2.2100000000         1.8000000000

 IN ROSBRK DP =
 1        0.0                  -0.40500000D 00

 P(I) I = 1 TO  2
        2.21000000D 00       1.39500000D 00

 IN ROSBRK N =  2  E(N) =   -0.4050000000D 00

   IZ    LOWER BOUND    UPPER BOUND       OCCUR(IZ)          PENALTY
    2 -1.00000000D 01  2.50000000D 00  1.39500000D 00  0.0
  400  0.0             1.10000000D 00  1.06286560D 00  0.0
 *FEV* F =  0.0              X =  2.21000000D 00  1.39500000D 00

   IZ    LOWER BOUND    UPPER BOUND       OCCUR(IZ)          PENALTY
    2 -1.00000000D 01  2.50000000D 00  1.39500000D 00  0.0
  400  0.0             1.10000000D 00  1.06286560D 00  0.0
 *FEV* F =  0.0              X =  2.21000000D 00  1.39500000D 00

 KRED =      0 ITERM =     -1

   IZ    LOWER BOUND    UPPER BOUND       OCCUR(IZ)          PENALTY
    2 -1.00000000D 01  1.25550000D 00  1.39500000D 00  1.94602500D-02
  400  0.0             1.10000000D 00  1.06286560D 00  0.0
 *FEV* F =  1.94602500D-02 X =  2.21000000D 00  1.39500000D 00

   NTRIA     N NSTAG NSUCC              U
     1       1    0    0        0.0194602500
 P(I) I = 1 TO  2
        2.2100000000         1.3950000000
```

```
IN ROSBRK DP =
 1       0.10000000D-01       0.0

 P(I) I = 1 TO 2
        2.22000000D 00       1.39500000 00

 IN ROSBRK N =  1  E(N) =     0.10000000000D-01

   IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
    2 -1.00000000 01   1.25550000 00   1.39500000 00   1.94602500-02
  400  0.0             1.10000000 00   1.06259060 00   0.0
 #FEV#  F =  1.94602500-02 X =  2.22000000 00   1.39500000 00

   NTRIA     N NSTAG NSUCC                 U
      2      1     0     1        0.0194602500
 P(I) I = 1 TO 2
        2.2200000000         1.3950000000

 IN ROSBRK DP =
 1       0.30000000D-01       0.0

 P(I) I = 1 TO 2
        2.25000000 00        1.39500000 00

 IN ROSBRK N =  1  E(N) =     0.30000000000D-01

   IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
    2 -1.00000000 01   1.25550000 00   1.39500000 00   1.94602500-02
  400  0.0             1.10000000 00   1.06251560 00   0.0
 #FEV#  F =  1.94602500-02 X =  2.25000000 00   1.39500000 00

   NTRIA     N NSTAG NSUCC                 U
      3      1     0     2        0.0194602500
 P(I) I = 1 TO 2
        2.2500000000         1.3950000000

 IN ROSBRK DP =
 1       0.90000000D-01       0.0

 P(I) I = 1 TO 2
        2.34000000 00        1.39500000 00

 IN ROSBRK N =  1  E(N) =     0.90000000000D-01

   IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
    2 -1.00000000 01   1.25550000 00   1.39500000 00   1.94602500-02
  400  0.0             1.10000000 00   1.06904060 00   0.0
 #FEV#  F =  1.94602500-02 X =  2.34000000 00   1.39500000 00

   NTRIA     N NSTAG NSUCC                 U
      4      1     0     3        0.0194602500
 P(I) I = 1 TO 2
        2.3400000000         1.3950000000

 IN ROSBRK DP
 1       0.27000000 00        0.0

 P(I) I = 1 TO 2
        2.61000000 00        1.39500000 00
```

```
IN ROSBRK N =  1  E(N) =     0.2700000000D 00

  IZ      LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
   2  -1.00000000D 01  1.25550000D 00  1.39500000D 00  1.94602500D-02
 400   0.0             1.10000000D 00  1.14936560D 00  2.43696490D-03
 *FEV*  F =  2.18972150-02 X =  2.61000000 00  1.39500000 00

  NTRIA      N NSTAG NSUCC                    U
    5        1    0    3         0.0218972149
 P(I) I = 1 TO  2
       2.6100000000          1.3950000000

 IN ROSBRK DP =
  1        0.0                 0.10000000D-01

 P(I) I = 1 TO  2
       2.34000000 00        1.40500000 00

 IN ROSBRK N =  2  E(N) =     0.1000000000D-01

  IZ      LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
   2  -1.00000000D 01  1.25550000D 00  1.40500000D 00  2.23502500D-02
 400   0.0             1.10000000D 00  1.07149060D 00  0.0
 *FEV*  F =  2.23502500-02 X =  2.34000000 00  1.40500000 00

  NTRIA      N NSTAG NSUCC                    U
    6        2    0    0         0.0223502500
 P(I) I = 1 TO  2
       2.3400000000          1.4050000000

 IN ROSBRK DP =
  1        0.0                -0.50000000D-02

 P(I) I = 1 TO  2
       2.34000000 00        1.39000000 00

 IN ROSBRK N =  2  E(N) =    -0.5000000000D-02

  IZ      LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
   2  -1.00000000D 01  1.25850000D 00  1.39000000D 00  1.80902500D-02
 400   0.0             1.10000000D 00  1.06786250D 00  0.0
 *FEV*  F =  1.80902500-02 X =  2.34000000 00  1.39000000 00

  NTRIA      N NSTAG NSUCC                    U
    7        2    0    1         0.0180902500
 P(I) I = 1 TO  2
       2.3400000000          1.3900000000

 IN ROSBRK DP =
  1        0.0                -0.15000000D-01

 P(I) I = 1 TO  2
       2.34000000 00        1.37500000 00

 IN ROSBRK N =  2  E(N) =    -0.1500000000D-01

  IZ      LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
   2  -1.00000000D 01  1.25550000D 00  1.37500000D 00  1.42802500D-02
 400   0.0             1.10000000D 00  1.06451560D 00  0.0
 *FEV*  F =  1.42802500-02 X =  2.34000000 00  1.37500000 00
```

```
NTRIA      N NSTAG NSUCC                        U
    0      2    0     2          0.0142802500
P(I) I = 1 TO  2
          2.3400000000         1.3750000000

IN ROSBRK DP =
1        0.0                  -0.45000000-01

P(I) I = 1 TO  2
         2.34000000D 00       1.33000000 00

IN ROSBRK N =   2  E(N) =    -0.45000000000D-01

   IZ     LOWER BOUND      UPPER BOUND       OCCUR(IZ)         PENALTY
    2 -1.00000000D 01  1.25550000D 00  1.33000000D 00  5.55025000D-03
  400  0.0             1.10000000D 00  1.05616250D 00  0.0
*FEV*  F =  5.55025000D-03 X =  2.34000000D 00  1.33000000D 00

NTRIA      N NSTAG NSUCC                        U
    0      2    0     3          0.0055502500
P(I) I = 1 TO  2
          2.3400000000         1.3300000000

IN ROSBRK DP =
1        0.0                  -0.13500000 00

P(I) I = 1 TO  2
         2.34000000D 00       1.19500000 00

IN ROSBRK N =   2  E(N) =    -0.13500000000D 00

   IZ     LOWER BOUND      UPPER BOUND       OCCUR(IZ)         PENALTY
    2 -1.00000000D 01  1.25550000D 00  1.19500000D 00  0.0
  400  0.0             1.10000000D 00  1.04629060D 00  0.0
*FEV*  F =  0.0            X =  2.34000000D 00  1.19500000D 00

   IZ     LOWER BOUND      UPPER BOUND       OCCUR(IZ)         PENALTY
    2 -1.00000000D 01  1.25550000D 00  1.19500000D 00  0.0
  400  0.0             1.10000000D 00  1.04629060D 00  0.0
*FEV*  F =  0.0            X =  2.34000000D 00  1.19500000D 00

KRED =      0 ITER* =      -1

   IZ     LOWER BOUND      UPPER BOUND       OCCUR(IZ)         PENALTY
    2 -1.00000000D 01  1.07550000D 00  1.19500000D 00  1.42802500D-02
  400  0.0             1.10000000D 00  1.04629060D 00  0.0
*FEV*  F =  1.42802500D-02 X =  2.34000000D 00  1.19500000D 00

NTRIA      N NSTAG NSUCC                        U
    1      1    0     0          0.0142802500
P(I) I = 1 TO  2
          2.3400000000         1.1950000000

IN ROSBRK DP =
1        0.10000000D-01        0.0

P(I) I = 1 TO  2
         2.35000000D 00       1.19500000D 00
```

```
IN ROSBRK N =  1  E(N) =     0.10000000000-01

  IZ    LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
   2 -1.00000000D 01  1.07550000 00  1.19500000 00  1.42802500-02
 400  0.0             1.10000000 00  1.04914060 00  0.0
#FEVA  F =  1.42802500-02 X =  2.35000000 00   1.19500000 00

   NTRIA       N NSTAB NSUCC                    U
       2       1    0     1          0.0142802500
 P(I) I = 1 TO  2
          2.3500000000          1.1950000000

 IN RUSBRK DP =
 1         0.30000000D-01          0.0

 P(I) I = 1 TO  2
          2.38000000 00         1.19500000 00

 IN ROSBRK N =  1  E(N) =     0.30000000000-01

  IZ    LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
   2 -1.00000000 01  1.07550000 00  1.19500000 00  1.42802500-02
 400  0.0             1.10000000 00  1.05844060 00  0.0
#FEVA  F =  1.42802500-02 X =  2.38000000 00   1.19500000 00

   NTRIA       N NSTAB NSUCC                    U
       3       1    0     2          0.0142802500
 P(I) I = 1 TO  2
          2.3800000000          1.1950000000

 IN ROSBRK DP =
 1         0.90000000D-01          0.0

 P(I) I = 1 TO  2
          2.47000000 00         1.19500000 00

 IN ROSBRK N =  1  E(N) =     0.90000000000-01

  IZ    LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
   2 -1.00000000 01  1.07550000 00  1.19500000 00  1.42802500-02
 400  0.0             1.10000000 00  1.09309060 00  0.0
#FEV*  F =  1.42802500-02 X =  2.47000000 00   1.19500000 00

   NTRIA       N NSTAB NSUCC                    U
       4       1    0     3          0.0142802500
 P(I) I = 1 TO  2
          2.4700000000          1.1950000000

 IN ROSBRK DP =
 1         0.27000000D 00          0.0

 P(I) I = 1 TO  2
          2.74000000 00         1.19500000 00

 IN ROSBRK N =  1  F(N) =     0.27000000000 00

  IZ    LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
   2 -1.00000000 01  1.07550000 00  1.19500000 00  1.42802500-02
 400  0.0             1.10000000 00  1.25779060 00  2.48978810-02
#FEV*  F =  3.91781310-02 X =  2.74000000 00   1.19500000 00
```

```
 NTRIA      N NSTAG NSUCC                     U
     5      1    0     3           0.0391781313
 P(I) I = 1 TO  2
            2.7400000000          1.1950000000

 IN ROSBRK DP =
 1        0.0                     0.10000000D-01

 P(I) I = 1 TO  2
            2.47000000D 00        1.20500000D 00

 IN ROSBRK N =   2  E(N) =      0.10000000000D-01

    I2      LOWER BOUND      UPPER BOUND        OCCUR(I2)          PENALTY
     2 -1.00000000D 01  1.07550000D 00  1.20500000D 00  1.67702500D-02
   400  0.0             1.10000000D 00  1.09206560D 00  0.0
 *FEV*  F =  1.67702500D-02 X =  2.47000000 00  1.20500000D 00

 NTRIA      N NSTAG NSUCC                     U
     6      2    0     0           0.0167702500
 P(I) I = 1 TO  2
            2.4700000000          1.2050000000

 IN ROSBRK DP =
 1        0.0                    -0.50000000D-02

 P(I) I = 1 TO  2
            2.47000000D 00        1.19000000D 00

 IN ROSBRK N =   2  E(N) =     -0.50000000000D-02

    I2      LOWER BOUND      UPPER BOUND        OCCUR(I2)          PENALTY
     2 -1.00000000D 01  1.07550000D 00  1.19000000D 00  1.31102500D-02
   400  0.0             1.10000000D 00  1.09365000D 00  0.0
 *FEV*  F =  1.31102500D-02 X =  2.47000000D 00  1.19000000D 00

 NTRIA      N NSTAG NSUCC                     U
     7      2    0     1           0.0131102500
 P(I) I = 1 TO  2
            2.4700000000          1.1900000000

 IN ROSBRK DP =
 1        0.0                    -0.15000000D-01

 P(I) I = 1 TO  2
            2.47000000D 00        1.17500000D 00

 IN ROSBRK N =   2  E(N) =     -0.15000000000D-01

    I2      LOWER BOUND      UPPER BOUND        OCCUR(I2)          PENALTY
     2 -1.00000000D 01  1.07550000D 00  1.17500000D 00  9.90025000D-03
   400  0.0             1.10000000D 00  1.09551560D 00  0.0
 *FEV*  F =  9.90025000D-03 X =  2.47000000D 00  1.17500000D 00

 NTRIA      N NSTAG NSUCC                     U
     8      2    0     2           0.0099002500
 P(I) I = 1 TO  2
            2.4700000000          1.1750000000
```

```
IN ROSBRK DP =
1       0.0                -0.45000000D-01

P(I) I = 1 TO  2
        2.47000000 00       1.13000000 00

IN ROSBRK N =  2  E(N) =   -0.45000000000D-01

   IZ    LOWER BOUND     UPPER BOUND      OCCUR(IZ)       PENALTY
    2 -1.00000000D 01  1.07550000D 00  1.13000000D 00  2.97025000D-03
  400  0.0             1.10000000D 00  1.10280000D 00  7.84000000D-06
 *FEV*  F =  2.97809000D-03 X =  2.47000000 00  1.13000000D 00

   NTRIA     N NSTAG NSUCC                  U
     9       2   0     3         0.0029780900
P(I) I = 1 TO  2
        2.4700000000        1.1300000000

IN ROSBRK DP =
1       0.0                -0.13500000D 00

P(I) I = 1 TO  2
        2.47000000D 00      9.95000000D-01

IN ROSBRK N =  2  E(N) =   -0.13500000000D 00

   IZ    LOWER BOUND     UPPER BOUND      OCCUR(IZ)       PENALTY
    2 -1.00000000D 01  1.07550000D 00  9.95000000D-01  0.0
  400  0.0             1.10000000D 00  1.13984060D 00  1.58727540D-03
 *FEV*  F =  1.58727540-03 X =  2.47000000 00  9.95000000D-01

   NTRIA     N NSTAG NSUCC                  U
    10       2   0     4         0.0015872754
P(I) I = 1 TO  2
        2.4700000000        0.9950000000

IN ROSBRK DP =
1       0.0                -0.40500000 00

P(I) I = 1 TO  2
        2.47000000D 00      5.90000000D-01

IN ROSBRK N =  2  E(N) =   -0.40500000000D 00

   IZ    LOWER BOUND     UPPER BOUND      OCCUR(IZ)       PENALTY
    2 -1.00000000 01  1.07650000D 00  5.90000000D-01  0.0
  400  0.0             1.10000000D 00  1.38765000D 00  8.27425220D-02
 *FEV*  F =  8.27425220-02 X =  2.47000000 00  5.90000000D-01

   NTRIA     N NSTAG NSUCC                  U
    11       2   0     4         0.0827425225
P(I) I = 1 TO  2
        2.4700000000        0.5900000000

C MATRIX FROM GRAM
        0.5449883506       -0.8384436163
       -0.8384436163       -0.5449883506

C MATRIX FROM ROSBRK
```

```
 5.45D-01 -8.38D-01
 8.38D-01 -5.45D-01

 NTRIA    N NSTAG NSUCC               U
  11      1   1     0          0.0015872754
 P(I) I = 1 TO  2
         2.4700000000        0.9950000000

 IN ROSBRK DP =
 1        0.35424240D-01      -0.54498840D-01

 P(I) I = 1 TO  2
        2.50542420 00       9.40501160D-01

 IN ROSBRK N =  1  E(N) =    0.65000000000D-01

   IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)         PENALTY
    2 -1.00000000 01   1.07550000 00   9.40501160D-01  0.0
  400  0.0             1.10000000 00   1.1844252D 00  7.12761870-03
 *FEV*  F =  7.12761870-03 X =  2.50542420 00  9.40501160-01

 NTRIA    N NSTAG NSUCC               U
  12      1   1     0          0.0071276187
 P(I) I = 1 TO  2
         2.5054242428        0.9405011649

 IN ROSBRK DP =
 1       -0.17712120-01        0.27249420-01

 P(I) I = 1 TO  2
        2.45228790 00       1.02224940 00

 IN ROSBRK N =  1  E(N) =   -0.32500000000D-01

   IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)         PENALTY
    2 -1.00000000 01   1.07550000 00   1.0222494D 00  0.0
  400  0.0             1.10000000 00   1.1206147D 00  4.2496770D-04
 *FEV*  F =  4.24967700-04 X =  2.45228790 00  1.02224940 00

 NTRIA    N NSTAG NSUCC               U
  13      1   1     1          0.0004249677
 P(I) I = 1 TO  2
         2.4522878786        1.0222494175

 IN ROSBRK DP =
 1       -0.53136360-01        0.81748250-01

 P(I) I = 1 TO  2
        2.3991515D 00       1.1039977D 00

 IN ROSBRK N =  1  E(N) =   -0.97500000000D-01

   IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)         PENALTY
    2 -1.00000000 01   1.07550000 00   1.1039977D 00  8.1211720D-04
  400  0.0             1.10000000 00   1.0752028D 00  0.0
 *FEV*  F =  8.12117200-04 X =  2.39915150 00  1.10399770 00

 NTRIA    N NSTAG NSUCC               U
  14      1   1     1          0.0008121172
 P(I) I = 1 TO  2
```

```
        2.3991515144         1.1039976701

 IN ROSBRK DP =
 1      0.83844360-01       0.54498840-01

 P(I) I = 1 TO  2
        2.5361322D 00        1.0767483D 00

 IN ROSBRK N =  2  E(N) =    -0.1000000000D 00

   IZ    LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
    2 -1.0000000D 01    1.0755000D 00    1.0767483D 00    1.5581345D-06
  400  0.0              1.1000000D 00    1.1524696D 00    2.7530627D-03
 AFEVA  F =  2.7544208D-03 X =   2.5361322D 00   1.0767483D 00

 NTRIA     N NSTAG NSUCC                        U
   15      2     1     0          0.0027546209
 P(I) I = 1 TO  2
        2.5361322402         1.0767482526

 IN ROSBRK DP =
 1     -0.41922180-01      -0.27249420-02

 P(I) I = 1 TO  2
        2.4103657D 00        9.9500000D-01

 IN ROSBRK N =  2  E(N) =     0.5000000000D-01

   IZ    LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
    2 -1.0000000D 01    1.0755000D 00    9.9500000D-01  0.0
  400  0.0              1.1000000D 00    1.1068045D 00    4.6301221D-05
 AFEVA  F =  4.6301221D-05 X =   2.4103657D 00   9.9500000D-01

 NTRIA     N NSTAG NSUCC                        U
   16      2     1     1          0.0000463012
 P(I) I = 1 TO  2
        2.4103656978         0.9950000000

 IN ROSBRK DP =
 1     -0.12576650 00      -0.81748250-01

 P(I) I = 1 TO  2
        2.2845992D 00        9.1325175D-01

 IN ROSBRK N =  2  E(N) =     0.1500000000D 00

   IZ    LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
    2 -1.0000000D 01    1.0755000D 00    9.1325175D-01  0.0
  400  0.0              1.1000000D 00    1.0738426D 00  0.0
 AFEVA  F =  0.0                 X =   2.2845992D 00   9.1325175D-01

   IZ    LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
    2 -1.0000000D 01    1.0755000D 00    9.1325175D-01  0.0
  400  0.0              1.1000000D 00    1.0738426D 00  0.0
 AFEVA  F =  0.0                 X =   2.2845992D 00   9.1325175D-01

 KRED =       0 ITERN =      -1

   IZ    LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
    2 -1.0000000D 01    8.2192657D-01    9.1325175D-01    6.3402875D-03
```

```
 400  0.0              1.10000000 00  1.07384260 00  0.0
#FEV#  F =  8.34028750-03 X =  2.28459920 00  9.13251750-01

NTRIA      N NSTAG NSUCC                    U
   1       1   0    0            0.0083402875
P(I) I = 1 TO  2
     2.2845991553          0.9132517474

IN ROSBRK DP =
 1        0.10000000D-01       0.0

P(I) I = 1 TO  2
     2.29459920 00         9.13251750-01

IN ROSBRK N =  1  E(N) =       0.10000000000D-01

  IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
   2  -1.00000000D-01  8.21926570-01   9.13251750-01   8.34028750-03
 400  0.0              1.10000000 00   1.07811320 00   0.0
#FEV#  F =  8.34028750-03 X =  2.29459920 00  9.13251750-01

NTRIA      N NSTAG NSUCC                    U
   2       1   0    1            0.0083402875
P(I) I = 1 TO  2
     2.2945991553          0.9132517474

IN ROSBRK DP =
 1        0.30000000D-01       0.0

P(I) I = 1 TO  2
     2.32459920 00         9.13251750-01

IN ROSBRK N =  1  E(N) =       0.30000000000D-01

  IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
   2  -1.00000000D-01  8.21926570-01   9.13251750-01   8.34028750-03
 400  0.0              1.10000000 00   1.09167500 00   0.0
#FEV#  F =  8.34028750-03 X =  2.32459920 00  9.13251750-01

NTRIA      N NSTAG NSUCC                    U
   3       1   0    2            0.0083402875
P(I) I = 1 TO  2
     2.3245991553          0.9132517474

IN ROSBRK DP =
 1        0.90000000D-01       0.0

P(I) I = 1 TO  2
     2.41459920 00         9.13251750-01

IN ROSBRK N =  1  E(N) =       0.90000000000D-01

  IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
   2  -1.00000000D-01  8.21926570-01   9.13251750-01   8.34028750-03
 400  0.0              1.10000000 00   1.13911040 00   1.52962250-03
#FEV#  F =  9.86991000-03 X =  2.41459920 00  9.13251750-01

NTRIA      N NSTAG NSUCC                    U
   4       1   0    2            0.0098699100
P(I) I = 1 TO  2
```

```
        2.4145991553        0.9132517474

  IN ROSBRK DP =
  1        0.0                0.10000000D-01

  P(I) I = 1 TO  2
        2.32459920 00       9.23251750-01

  IN ROSBRK N =  2  E(N) =    0.10000000000-01

     IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
      2 -1.00000000D 01  8.11926570-01  9.23251750-01  1.02667910-02
    400  0.0             1.10000000 00  1.08821860 00  0.0
  #FEVA  F =  1.02667910-02 X =  2.32459920 00  9.23251750-01

  NTRIA      N NSTAG NSUCC                 U
     5       2    0     0        0.0102667910
  P(I) I = 1 TO  2
        2.3245991553        0.9232517474

  IN ROSBRK DP =
  1        0.0               -0.50000000D-02

  P(I) I = 1 TO  2
        2.32459920 00       9.08251750-01

  IN ROSBRK N =  2  E(N) =   -0.50000000000-02

     IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
      2 -1.00000000D 01  8.21926570-01  9.08251750-01  7.45203580-03
    400  0.0             1.10000000 00  1.09345000 00  0.0
  #FEVA  F =  7.45203580-03 X =  2.32459920 00  9.08251750-01

  NTRIA      N NSTAG NSUCC                 U
     6       2    0     1        0.0074520358
  P(I) I = 1 TO  2
        2.3245991553        0.9082517474

  IN ROSBRK DP =
  1        0.0               -0.15000000D-01

  P(I) I = 1 TO  2
        2.32459920 00       8.93251750-01

  IN ROSBRK N =  2  E(N) =   -0.15000000000-01

     IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
      2 -1.00000000D 01  8.21926570-01  8.93251750-01  5.08728060-03
    400  0.0             1.10000000 00  1.09896270 00  0.0
  #FEVA  F =  5.08728060-03 X =  2.32459920 00  8.93251750-01

  NTRIA      N NSTAG NSUCC                 U
     7       2    0     2        0.0050872806
  P(I) I = 1 TO  2
        2.3245991553        0.8932517474

  IN ROSBRK DP =
  1        0.0               -0.45000000D-01
```

```
P(I) I = 1 TO  2
        2.32459920 00          8.48251750-01

IN ROSBRK N =   2  E(N) =    -0.45000000000-01

  IZ    LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
   2 -1.00000000D 01   8.21926570-01    8.43251750-01    6.93014830-04
 400  0.0              1.10000000 00    1.11718810 00    2.95430980-04
*FEV*  F =   9.88445810-04 X =   2.32459920 00   8.48251750-01

 NTRIA      N NSTAG NSUCC                 U
     8      2     0     3       0.0009884458
P(I) I = 1 TO  2
        2.3245991553          0.8482517474

IN ROSBRK DP =
1        0.0                 -0.13500000 00

P(I) I = 1 TO  2
        2.32459920 00          7.13251750-01

IN ROSBRK N =   2  E(N) =    -0.13500000000 00

  IZ    LOWER BOUND      UPPER BOUND       OCCUR(IZ)        PENALTY
   2 -1.00000000D 01   8.21926570-01   7.13251750-01   0.0
 400  0.0              1.10000000 00   1.18705190 00   7.57803550-03
*FEV*  F =   7.57803550-03 X =   2.32459920 00   7.13251750-01

 NTRIA      N NSTAG NSUCC                 U
     9      2     0     3       0.0075780355
P(I) I = 1 TO  2
        2.3245991553          0.7132517474

G MATRIX FROM GRAM
        0.5240974257         -0.8516583167
       -0.8516583167         -0.5240974257

G MATRIX FROM ROSBRK

 5.240-01 -8.520-01
-8.520-01 -5.240-01

 NTRIA      N NSTAG NSUCC                 U
     9      1     1     0       0.0009884458
P(I) I = 1 TO  2
        2.3245991553          0.8482517474

IN ROSBRK DP =
1        0.10481950-01       -0.17033170-01

P(I) I = 1 TO  2
       2.33508110 00         8.31218580-01

IN ROSBRK N =   1  E(N) =     0.20000000000-01

  IZ    LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
   2 -1.00000000D 01   8.21926570-01    8.31218580-01    8.63414200-05
 400  0.0              1.10000000 00    1.13039570 00    9.23896700-04
*FEV*  F =   1.01023810-03 X =   2.33508110 00   8.31218580-01
```

```
 NTRIA      N NSTAG NSUCC                 U
   10       1   1     0          0.0010102381
P(I) I = 1 TO  2
         2.3350811039         0.8312185811

IN ROSBRK DP =
1        -0.52409740D-02        0.85165830D-02

P(I) I = 1 TO  2
         2.31935820 00        8.56768330-01

IN ROSBRK N =   1  E(N) =   -0.10000000000D-01

   I2      LOWER BOUND      UPPER BOUND        OCCUR(I2)          PENALTY
   2 -1.00000000D 01   8.21926570-01   8.56768330-01   1.21394810-03
 400   0.0              1.10000000 00   1.11087230 00   1.18205880-04
*FEV*  F =   1.33215460-03 X =   2.31935820 00   8.56768330-01

 NTRIA      N NSTAG NSUCC                 U
   11       1   1     0          0.0013321540
P(I) I = 1 TO  2
         2.3193581811         0.8567683306

IN ROSBRK DP =
1        0.26204870-02        -0.42582920-02

P(I) I = 1 TO  2
         2.32721960 00        8.43993460-01

IN ROSBRK N =   1  E(N) =    0.50000000000D-02

   I2      LOWER BOUND      UPPER BOUND        OCCUR(I2)          PENALTY
   2 -1.00000000D 01   8.21926570-01   8.43993460-01   4.86947330-04
 400   0.0              1.10000000 00   1.12041890 00   4.16895310-04
*FEV*  F =   9.03842640-04 X =   2.32721960 00   8.43993460-01

 NTRIA      N NSTAG NSUCC                 U
   12       1   1     1          0.0000038426
P(I) I = 1 TO  2
         2.3272196425         0.8439934558

IN ROSBRK DP =
1        0.78614610-02        -0.12774870-01

P(I) I = 1 TO  2
         2.33508110 00        8.31218580-01

IN ROSBRK N =   1  E(N) =    0.15000000000D-01

   I2      LOWER BOUND      UPPER BOUND        OCCUR(I2)          PENALTY
   2 -1.00000000D 01   8.21926570-01   8.31218580-01   8.63414200-05
 400   0.0              1.10000000 00   1.13039570 00   9.23896700-04
*FEV*  F =   1.01023810-03 X =   2.33508110 00   8.31218580-01

 NTRIA      N NSTAG NSUCC                 U
   13       1   1     1          0.0010102381
P(I) I = 1 TO  2
         2.3350811039         0.8312185811
```

```
IN ROSBRK DP =
1      0.27670490D-01      0.17033170-01

P(I) I = 1 TO  2
        2.35489850 00        8.61026620-01

IN ROSBRK N =  2  E(N) =    -0.32500000000-01

   IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)        PENALTY
    2  -1.00000000 01   8.21926570-01   8.61026620-01   1.52081390-03
  400   0.0             1.10000000 00   1.12778270 00   7.71878080-04
 *FEV*  F =  2.30069190-03 X =  2.35489850 00  8.61026620-01

 NTRIA      N NSTAG NSUCC                 U
   14       2    1    0        0.0023006919
P(I) I = 1 TO  2
        2.3548985378        0.8610266222

IN ROSBRK DP =
1     -0.13830450-01     -0.25145030-02

P(I) I = 1 TO  2
        2.31338020 00        8.35476870-01

IN ROSBRK N =  2  E(N) =     0.16250000000-01

   IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)        PENALTY
    2  -1.00000000 01   8.21926570-01   8.35476870-01   1.83610630-04
  400   0.0             1.10000000 00   1.11696560 00   2.87831450-04
 *FEV*  F =  4.71442080-04 X =  2.31338020 00  8.35476870-01

 NTRIA      N NSTAG NSUCC                 U
   15       2    1    1        0.0004714421
P(I) I = 1 TO  2
        2.3133801948        0.8354768727

IN ROSBRK DP =
1     -0.41518340-01     -0.25549750-01

P(I) I = 1 TO  2
        2.27186190 00        8.09927120-01

IN ROSBRK N =  2  E(N) =     0.48750000000-01

   IZ    LOWER BOUND    UPPER BOUND      OCCUR(IZ)        PENALTY
    2  -1.00000000 01   8.21926570-01   8.09927120-01   0.0
  400   0.0             1.10000000 00   1.10752800 00   5.66711810-05
 *FEV*  F =  5.66711810-05 X =  2.27186190 00  8.09927120-01

 NTRIA      N NSTAG NSUCC                 U
   16       2    1    2        0.0000566712
P(I) I = 1 TO  2
        2.2718618519        0.8099271232

IN ROSBRK DP =
1      0.12455580 00     -0.76649250-01

P(I) I = 1 TO  2
        2.14730680 00        7.33277870-01
```

```
IN ROSBRK N =  2  E(N) =     0.14625000000 00

  IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
   2 -1.00000000D 01  8.21926570D-01  7.33277870D-01  0.0
 400  0.0             1.10000000 00   1.08749250 00   0.0
*FEVA  F =  0.0                X =  2.14730680 00   7.33277870D-01

  IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
   2 -1.00000000D 01  8.21926570D-01  7.33277870D-01  0.0
 400  0.0             1.10000000 00   1.08749250 00   0.0
*FEV*  F =  0.0                X =  2.14730680 00   7.33277870D-01

KRED =       0 ITERM =      -1

  IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
   2 -1.00000000D 01  6.59950090D-01  7.33277870D-01  5.37696440D-03
 400  0.0             1.10000000 00   1.08749250 00   0.0
*FEVA  F =  5.37696440D-03 X =  2.14730680 00   7.33277870D-01

   NTRIA     N NSTAG NSUCC                 U
      1      1     0     0          0.0053769644
 P(I) I = 1 TO  2
          2.1473068231          0.7332778747

 IN ROSBRK DP =
 1        0.10000000D-01        0.0

 P(I) I = 1 TO  2
          2.15730680 00         7.33277870D-01

IN ROSBRK N =  1  E(N) =     0.10000000000D-01

  IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
   2 -1.00000000D 01  6.59950090D-01  7.33277870D-01  5.37696440D-03
 400  0.0             1.10000000 00   1.09139670 00   0.0
*FEV*  F =  5.37696440D-03 X =  2.15730680 00   7.33277870D-01

   NTRIA     N NSTAG NSUCC                 U
      2      1     0     1          0.0053769644
 P(I) I = 1 TO  2
          2.1573068231          0.7332778747

 IN ROSBRK DP =
 1        0.30000000D-01        0.0

 P(I) I = 1 TO  2
          2.18730680 00         7.33277870D-01

IN ROSBRK N =  1  E(N) =     0.30000000000D-01

  IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
   2 -1.00000000D 01  6.59950090D-01  7.33277870D-01  5.37696440D-03
 400  0.0             1.10000000 00   1.10385950 00   1.48956770D-05
*FEVA  F =  5.39186010D-03 X =  2.18730680 00   7.33277870D-01

   NTRIA     N NSTAG NSUCC                 U
      3      1     0     1          0.0053918601
 P(I) I = 1 TO  2
          2.1873068231          0.7332778747
```

```
IN ROSBRK DP =
   1      0.0              0.10000000D-01

 P(I) I = 1 TO  2
        2.15730680D 00        7.43277870D-01

IN ROSBRK N =  2  E(N) =    0.10000000000D-01

    IZ    LOWER BOUND     UPPER BOUND       OCCUR(IZ)         PENALTY
     2 -1.00000000D 01  6.59950090D-01  7.43277870D-01  6.94352020D-03
   400  0.0             1.10000000D 00  1.08694540 00  0.0
 *FEV*  F =  6.94352020D-03 X =  2.15730680D 00  7.43277870D-01

   NTRIA      N NSTAG NSUCC                  U
       4      2     0     0        0.0069435202
 P(I) I = 1 TO  2
          2.1573068231          0.7432778747

IN ROSBRK DP =
   1      0.0             -0.50000000D-02

 P(I) I = 1 TO  2
        2.15730680D 00        7.28277870D-01

IN ROSBRK N =  2  E(N) =    -0.50000000000D-02

    IZ    LOWER BOUND     UPPER BOUND       OCCUR(IZ)         PENALTY
     2 -1.00000000D 01  6.59950090D-01  7.28277870D-01  4.66868650D-03
   400  0.0             1.10000000D 00  1.09366930 00  0.0
 *FEV*  F =  4.66868650D-03 X =  2.15730680D 00  7.28277870D-01

   NTRIA      N NSTAG NSUCC                  U
       5      2     0     1        0.0046686865
 P(I) I = 1 TO  2
          2.1573068231          0.7282778747

IN ROSBRK DP =
   1      0.0             -0.15000000D-01

 P(I) I = 1 TO  2
        2.15730680D 00        7.13277870D-01

IN ROSBRK N =  2  E(N) =    -0.15000000000D-01

    IZ    LOWER BOUND     UPPER BOUND       OCCUR(IZ)         PENALTY
     2 -1.00000000D 01  6.59950090D-01  7.13277870D-01  2.84385290D-03
   400  0.0             1.10000000D 00  1.10067440 00  4.54806690D-07
 *FEV*  F =  2.84430770D-03 X =  2.15730680D 00  7.13277870D-01

   NTRIA      N NSTAG NSUCC                  U
       6      2     0     2        0.0028443077
 P(I) I = 1 TO  2
          2.1573068231          0.7132778747

IN ROSBRK DP =
   1      0.0             -0.45000000D-01

 P(I) I = 1 TO  2
        2.15730680D 00        6.68277870D-01
```

```
IN ROSBRK N =  2  E(N) =    -0.4500000000D-01

  IZ      LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
   2  -1.00000000D 01    6.59950090D-01    6.68277870D-01    6.93520440D-05
 400   0.0               1.10000000D 00    1.12337720D 00    5.46495510D-04
#FEV#   F =   6.15847550D-04  X =    2.15730680D 00    6.68277870D-01

   NTRIA       N NSTAG NSUCC                    U
     7         2   0     3             0.0006158476
 P(I)  I = 1 TO  2
         2.1573068231          0.6682778747

 IN ROSBRK DP =
  1        0.0                 -0.1350000D 00

 P(I)  I = 1 TO  2
         2.15730680D 00        5.33277870D-01

 IN ROSBRK N =  2  E(N) =    -0.1350000000D 00

  IZ      LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
   2  -1.00000000D 01    6.59950090D-01    5.33277870D-01    0.0
 400   0.0               1.10000000D 00    1.20667330D 00    1.13791910D-02
#FEV#   F =   1.13791910D-02  X =    2.15730680D 00    5.33277870D-01

   NTRIA       N NSTAG NSUCC                    U
     8         2   0     3             0.0113791914
 P(I)  I = 1 TO  2
         2.1573068231          0.5332778747

 C MATRIX FROM GRAM
         0.1520571843         -0.9883716977
        -0.9883716977         -0.1520571843

 C MATRIX FROM ROSBRK

  1.520D-01  -9.880D-01
 -9.880D-01  -1.520D-01

   NTRIA       N NSTAG NSUCC                    U
     8         1   1     0             0.0006158476
 P(I)  I = 1 TO  2
         2.1573068231          0.6682778747

 IN ROSBRK DP =
  1        0.76028590D-03       -0.49418650D-02

 P(I)  I = 1 TO  2
         2.15806710D 00        6.63336020D-01

 IN ROSBRK N =  1  E(N) =     0.5000000000D-02

  IZ      LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
   2  -1.00000000D 01    6.59950090D-01    6.63336020D-01    1.14645150D-05
 400   0.0               1.10000000D 00    1.12636650D 00    6.95194040D-04
#FEV#   F =   7.06658550D-04  X =    2.15806710D 00    6.63336020D-01

   NTRIA       N NSTAG NSUCC                    U
     9         1   1     0             0.0007066586
 P(I)  I = 1 TO  2
```

```
        2.1580671090          0.6633360162

 IN ROSBRK DP =
 1        -0.3801430D-03        0.2470929D-02

 P(I) I = 1 TO  2
          2.1569267D 00        6.7074860D-01

 IN ROSBRK N =  1  E(N) =    -0.2500000000D-02

   IZ     LOWER BOUND      UPPER BOUND       OCCUR(IZ)        PENALTY
    2 -1.00000000D 01   6.59950090D-01   6.70748800D-01   1.16612280D-04
  400  0.0              1.10000000D 00   1.12169640D 00   4.79453690D-04
 AFEVA  F =  5.84065970D-04 X =  2.15692670 00   6.70748800D-01

   NTRIA      N NSTAG NSUCC                   U
     10       1    1    1            0.0005960660
 P(I) I = 1 TO  2
          2.1569266801          0.6707488039

 IN ROSBRK DP =
 1        -0.1140429D-02        0.7412788D-02

 P(I) I = 1 TO  2
          2.1557863D 00        6.7816159D-01

 IN ROSBRK N =  1  E(N) =    -0.7500000000D-02

   IZ     LOWER BOUND      UPPER BOUND       OCCUR(IZ)        PENALTY
    2 -1.00000000D 01   6.59950090D-01   6.78161590D-01   3.31658890D-04
  400  0.0              1.10000000D 00   1.11750930D 00   3.06576380D-04
 AFEVA  F =  6.38238270D-04 X =  2.15578630 00   6.78161590D-01

   NTRIA      N NSTAG NSUCC                   U
     11       1    1    1            0.0006382353
 P(I) I = 1 TO  2
          2.1557862512          0.6781615916

 IN ROSBRK DP =
 1         0.3212208D-01        0.4941858D-02

 P(I) I = 1 TO  2
          2.1890488D 00        6.7569066D-01

 IN ROSBRK N =  2  E(N) =    -0.3250000000D-01

   IZ     LOWER BOUND      UPPER BOUND       OCCUR(IZ)        PENALTY
    2 -1.00000000D 01   6.59950090D-01   6.75690660D-01   2.47765710D-04
  400  0.0              1.10000000D 00   1.13405520D 00   1.15975640D-03
 AFEVA  F =  1.40752210D-03 X =  2.18904880D 00   6.75690660D-01

   NTRIA      N NSTAG NSUCC                   U
     12       2    1    0            0.0014075221
 P(I) I = 1 TO  2
          2.1890487603          0.6756906624

 IN ROSBRK DP =
 1        -0.1606104D-01       -0.2470929D-02
```

```
P(I) I = 1 TO  2
          2.1408656D 00          6.6827787D-01

IN ROSBRK N =  2  E(N) =    0.1625000000D-01

  IZ      LOWER BOUND      UPPER BOUND       OCCUR(IZ)        PENALTY
   2 -1.0000000D 01   6.5995009D-01   6.6827787D-01   6.9352044D-05
 400  0.0             1.1000000D 00   1.1162229D 00   2.6318160D-04
*FEV*  F =  3.3253364D-04 X =  2.1408656D 00   6.6827787D-01

 NTRIA      N NSTAG NSUCC                   U
    13      2    1     1          0.0003325336
P(I) I = 1 TO  2
          2.1408656400          0.6682778747

IN ROSBRK DP =
1       -0.4818312D-01        -0.7412788D-02

P(I) I = 1 TO  2
          2.0926825D 00          6.6086509D-01

IN ROSBRK N =  2  E(N) =    0.4075000000D-01

  IZ      LOWER BOUND      UPPER BOUND       OCCUR(IZ)        PENALTY
   2 -1.0000000D 01   6.5995009D-01   6.6086509D-01   8.3722451D-07
 400  0.0             1.1000000D 00   1.1008255D 00   6.8144269D-07
*FEV*  F =  1.5186672D-06 X =  2.0926825D 00   6.6086509D-01

 NTRIA      N NSTAG NSUCC                   U
    14      2    1     2          0.0000015187
P(I) I = 1 TO  2
          2.0926825188          0.6608650869

IN ROSBRK DP =
1       -0.1445494D 00        -0.2223836D-01

P(I) I = 1 TO  2
          1.9481332D 00          6.3862672D-01

IN ROSBRK N =  2  E(N) =    0.1462500000D 00

  IZ      LOWER BOUND      UPPER BOUND       OCCUR(IZ)        PENALTY
   2 -1.0000000D 01   6.5995009D-01   6.3862672D-01   0.0
 400  0.0             1.1000000D 00   1.0692430D 00   0.0
*FEV*  F =  0.0            X =  1.9481332D 00   6.3862672D-01

  IZ      LOWER BOUND      UPPER BOUND       OCCUR(IZ)        PENALTY
   2 -1.0000000D 01   6.5995009D-01   6.3862672D-01   0.0
 400  0.0             1.1000000D 00   1.0692430D 00   0.0
*FEV*  F =  0.0            X =  1.9481332D 00   6.3862672D-01

KRED =      0 ITERM =      -1

  IZ      LOWER BOUND      UPPER BOUND       OCCUR(IZ)        PENALTY
   2 -1.0000000D 01   5.7476405D-01   6.3862672D-01   4.0784409D-03
 400  0.0             1.1000000D 00   1.0692430D 00   0.0
*FEV*  F =  4.0784409D-03 X =  1.9481332D 00   6.3862672D-01

 NTRIA      N NSTAG NSUCC                   U
     1      1    0     0          0.0040784409
```

```
P(I) I = 1 TO  2
          1.9481331590        0.6386267237

IN ROSBRK DP =
1        0.10000000D-01        0.0

P(I) I = 1 TO  2
          1.95813320 00      6.38626720-01

IN ROSBRK N =  1  E(N) =    0.10000000000D-01

  IZ    LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
   2 -1.00000000D 01  5.74764050D-01  6.38626720D-01  4.07844090D-03
 400  0.0             1.10000000 00   1.07134750 00   0.0
*FEV*  F =  4.07844090D-03 X =  1.95813320 00   6.38626720D-01

  NTRIA      N NSTAG NSUCC                U
     2       1    0     1            0.0040784409
P(I) I = 1 TO  2
          1.9581331590        0.6386267237

IN ROSBRK DP =
1        0.30000000D-01        0.0

P(I) I = 1 TO  2
          1.98813320 00      6.38626720-01

IN ROSBRK N =  1  E(N) =    0.30000000000D-01

  IZ    LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
   2 -1.00000000D 01  5.74764050D-01  6.38626720D-01  4.07844090D-03
 400  0.0             1.10000000 00   1.07849090 00   0.0
*FEV*  F =  4.07844090D-03 X =  1.98813320 00   6.38626720D-01

  NTRIA      N NSTAG NSUCC                U
     3       1    0     2            0.0040784409
P(I) I = 1 TO  2
          1.9881331590        0.6386267237

IN ROSBRK DP =
1        0.90000000D-01        0.0

P(I) I = 1 TO  2
          2.07813320 00      6.38626720-01

IN ROSBRK N =  1  E(N) =    0.90000000000D-01

  IZ    LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
   2 -1.00000000D 01  5.74764050D-01  6.38626720D-01  4.07844090D-03
 400  0.0             1.10000000 00   1.10661110 00   4.37062970-05
*FEV*  F =  4.12214720-03 X =  2.07813320 00   6.38626720D-01

  NTRIA      N NSTAG NSUCC                U
     4       1    0     2            0.0041221472
P(I) I = 1 TO  2
          2.0781331590        0.6386267237

IN ROSBRK DP =
1        0.0                  0.10000000D-01
```

```
P(I) I = 1 TO  2
        1.98813320 00        6.48626720-01

IN ROSBRK N =  2  E(N) =    0.10000000000-01

  IZ    LOWER BOUND      UPPER BOUND        OCCUR(IZ)         PENALTY
   2 -1.00000000 01   5.74764050-01   6.48626720-01   5.45569440-03
 400  0.0             1.10000000 00   1.07412520 00   0.0
*FEV*  F =  5.45569440-03 X =  1.98813320 00   6.48626720-01

 NTRIA      N NSTAG NSUCC                  U
     5      2   0     0          0.0054556944
P(I) I = 1 TO  2
        1.9881331580         0.6486267217

IN ROSBRK OP =
1          0.0                -0.50000000-02

P(I) I = 1 TO  2
        1.98813320 00        6.33626720-01

IN ROSBRK N =  2  E(N) =   -0.50000000000-02

  IZ    LOWER BOUND      UPPER BOUND        OCCUR(IZ)         PENALTY
   2 -1.00000000 01   5.74764050-01   6.33626720-01   3.46481420-03
 400  0.0             1.10000000 00   1.08072060 00   0.0
*FEV*  F =  3.46481420-03 X =  1.98813320 00   6.33626720-01

 NTRIA      N NSTAG NSUCC                  U
     6      2   0     1          0.0034648142
P(I) I = 1 TO  2
        1.9881331580         0.6336267217

IN ROSBRK OP =
1          0.0                -0.15000000-01

P(I) I = 1 TO  2
        1.98813320 00        6.18626720-01

IN ROSBRK N =  2  E(N) =   -0.15000000000-01

  IZ    LOWER BOUND      UPPER BOUND        OCCUR(IZ)         PENALTY
   2 -1.00000000 01   5.74764050-01   6.18626720-01   1.92393400-03
 400  0.0             1.10000000 00   1.08759730 00   0.0
*FEV*  F =  1.92393400-03 X =  1.98813320 00   6.18626720-01

 NTRIA      N NSTAG NSUCC                  U
     7      2   0     2          0.0019239340
P(I) I = 1 TO  2
        1.9881331580         0.6186267217

IN ROSBRK OP =
1          0.0                -0.45000000-01

P(I) I = 1 TO  2
        1.98813320 00        5.73626720-01

IN ROSBRK N =  2  F(N) =   -0.45000000000-01
```

```
   IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)         PENALTY
    2  -1.00000000D 01   5.74764050D-01   5.73626720D-01   0.0
  400   0.0               1.10000000D 00   1.10991460D 00   9.82991440D-05
*FEV*  F =  9.82991440D-05 X =  1.98813320 00  5.73626720D-01

   NTRIA     N NSTAG NSUCC                  U
     8       2    0     3         0.0000982991
  P(I) I = 1 TO  2
         1.9881331590          0.5736267237

  IN ROSBRK DP =
  1        0.0                -0.13500000 00

  P(I) I = 1 TO  2
         1.98813320 00         4.38826720-01

  IN ROSBRK N =  2  E(N) =    -0.13500000000 00

   IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)         PENALTY
    2  -1.00000000D 01   5.74764050D-01   4.38626720D-01   0.0
  400   0.0               1.10000000D 00   1.19205420 00   8.47397390-03
*FEV*  F =  8.47397390D-03 X =  1.98813320 00  4.38626720D-01

   NTRIA     N NSTAG NSUCC                  U
     9       2    0     3         0.0084739739
  P(I) I = 1 TO  2
         1.9881331590          0.4386267237

  C MATRIX FROM GRAM
           0.5240974257         -0.0516583167
          -0.0516583167         -0.5240974257

  C MATRIX FROM ROSBRK

   5.24D-01 -8.52D-01
  -8.52D-01 -5.24D-01

   NTRIA     N NSTAG NSUCC                  U
     9       1    1     0         0.0000982991
  P(I) I = 1 TO  2
         1.9881331590          0.5736267237

  IN ROSBRK DP =
  1        0.10481950-01       0.17033170-01

  P(I) I = 1 TO  2
         1.99861510 00         5.56593560-01

  IN ROSBRK N =  1  E(N) =     0.20000000000-01

   IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)         PENALTY
    2  -1.00000000D 01   5.74764050D-01   5.56593560D-01   0.0
  400   0.0               1.10000000D 00   1.12242140 00   5.02721050D-04
*FEV*  F =  5.02721050D-04 X =  1.99861510 00  5.56593560D-01

   NTRIA     N NSTAG NSUCC                  U
    10       1    1     0         0.0005027211
  P(I) I = 1 TO  2
         1.9986151075          0.5565935574
```

```
IN ROSBRK DP =
  1      -0.5240974D-03      0.8516583D-02

P(I) I = 1 TO  2
        1.9828922D 00       5.8214331D-01

IN ROSBRK N =  1  E(N) =   -0.1000000000D-01

   IZ     LOWER BOUND     UPPER BOUND      OCCUR(IZ)        PENALTY
    2 -1.00000000 01  5.7476405D-01  5.8214331D-01  5.4453412D-05
  400  0.0            1.10000000 00  1.1039491D 00  1.5595367D-05
 NFEVA  F =  7.0048778D-05 X =  1.9828922D 00  5.8214331D-01

   NTRIA      N NSTAG NSUCC                 U
     11       1    1     1          0.0000700488
P(I) I = 1 TO  2
        1.9828921847        0.5821433069

IN ROSBRK DP =
  1      -0.1572202D-01      0.2554075D-01

P(I) I = 1 TO  2
        1.9671693D 00       6.0769306D-01

IN ROSBRK N =  1  E(N) =   -0.3000000000D-01

   IZ     LOWER BOUND     UPPER BOUND      OCCUR(IZ)        PENALTY
    2 -1.0000000D 01  5.7476405D-01  6.0769306D-01  1.0843194D-03
  400  0.0            1.10000000 00  1.0872043D 00  0.0
 NFEVA  F =  1.0843194D-03 X =  1.9671693D 00  6.0769306D-01

   NTRIA      N NSTAG NSUCC                 U
     12       1    1     1          0.0010843194
P(I) I = 1 TO  2
        1.9671692620        0.6076930564

IN ROSBRK DP =
  1       0.2747840D-01      0.1703317D-01

P(I) I = 1 TO  2
        2.0105711D 00       5.9917647D-01

IN ROSBRK N =  2  E(N) =   -0.3250000000D-01

   IZ     LOWER BOUND     UPPER BOUND      OCCUR(IZ)        PENALTY
    2 -1.00000000 01  5.7476405D-01  5.9917647D-01  5.9596624D-04
  400  0.0            1.10000000 00  1.1036599D 00  1.3394742D-05
 NFEVA  F =  6.0936108D-04 X =  2.0105711D 00  5.9917647D-01

   NTRIA      N NSTAG NSUCC                 U
     13       2    1     0          0.0006093611
P(I) I = 1 TO  2
        2.0105710800        0.5991764732

IN ROSBRK DP =
  1      -0.1383945D-01     -0.8516583D-02

P(I) I = 1 TO  2
        1.9690527D 00       5.7362672D-01
```

```
IN ROSBRK N =  2  E(N) =     0.16250000000-01

  IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
   2 -1.00000000 01   5.74764050-01  5.73626720-01   0.0
 400  0.0             1.10000000 00  1.10432360 00  1.86937370-05
 *FEV*  F =  1.86937370-05 X =  1.96905270 00  5.73626720-01

  NTRIA      N NSTAG NSUCC                      U
   14        2    1     1           0.0000186937
 P(I) I = 1 TO  2
          1.9690527371          0.5736267237

 IN ROSBRK DP =
 1         -0.41518340-01        -0.25549750-01

 P(I) I = 1 TO  2
         1.92753440 00         5.48076970-01

IN ROSBRK N =  2  E(N) =     0.48750000000-01

  IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
   2 -1.00000000 01   5.74764050-01  5.48076970-01   0.0
 400  0.0             1.10000000 00  1.10636690 00  4.05373700-05
 *FEV*  F =  4.05373700-05 X =  1.92753440 00  5.48076970-01

  NTRIA      N NSTAG NSUCC                      U
   15        2    1     1           0.0000405374
 P(I) I = 1 TO  2
          1.9275343941          0.5480769742

 C MATRIX FROM GRAM
          -1.0000000000        -0.0000000000
           0.0000000000        -1.0000000000

 C MATRIX FROM ROSBRK

 -1.000D 00 -4.07D-15
 -1.77D-15 -1.000D 00

  NTRIA      N NSTAG NSUCC                      U
   15        1    2     0           0.0000186937
 P(I) I = 1 TO  2
          1.9690527371          0.5736267237

 IN ROSBRK DP =
 1          0.50000000D-02        -0.88643500-17

 P(I) I = 1 TO  2
         1.97405270 00         5.73626720-01

 IN ROSBRK N =  1  E(N) =    -0.50000000000-02

  IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
   2 -1.00000000 01   5.74764050-01  5.73626720-01   0.0
 400  0.0             1.10000000 00  1.10574470 00  3.30019210-05
 *FEV*  F =  3.30019210-05 X =  1.97405270 00  5.73626720-01

  NTRIA      N NSTAG NSUCC                      U
   16        1    2     0           0.0000330019
 P(I) I = 1 TO  2
```

```
        1.9740527371        0.5736267237

 IN ROSBRK DP =
  1     -0.25000000D-02      0.44321175D-17

 P(I) I = 1 TO  2
        1.96655270 00       5.73626720-01

 IN ROSBRK N =  1  E(N) =    0.25000000000D-02

    IZ     LOWER BOUND     UPPER BOUND      OCCUR(IZ)        PENALTY
     2 -1.00000000D 01  5.74764050D-01  5.73626720D-01  0.0
   400  0.0             1.10000000D 00  1.10362480D 00  1.31391170D-05
 *FEV* F =  1.31391170-05 X =  1.96655270 00  5.73626720-01

   NTRIA     N NSTAG NSUCC                  U
     17      1   2     1        0.0000131391
 P(I) I = 1 TO  2
        1.9665527371        0.5736267237

 IN ROSBRK DP =
  1     -0.75000000D-02      0.13296530-16

 P(I) I = 1 TO  2
        1.95905270 00       5.73626720-01

 IN ROSBRK N =  1  E(N) =    0.75000000000D-02

    IZ     LOWER BOUND     UPPER BOUND      OCCUR(IZ)        PENALTY
     2 -1.00000000D 01  5.74764050D-01  5.73626720D-01  0.0
   400  0.0             1.10000000D 00  1.10157520 00  2.48115010-06
 *FEV* F =  2.48115010-06 X =  1.95905270 00  5.73626720-01

   NTRIA     N NSTAG NSUCC                  U
     18      1   2     2        0.0000024812
 P(I) I = 1 TO  2
        1.9590527371        0.5736267237

 IN ROSBRK DP =
  1     -0.22500000D-01      0.39889580-16

 P(I) I = 1 TO  2
        1.93655270 00       5.73626720-01

 IN ROSBRK N =  1  E(N) =    0.22500000000D-01

    IZ     LOWER BOUND     UPPER BOUND      OCCUR(IZ)        PENALTY
     2 -1.00000000D 01  5.74764050D-01  5.73626720D-01  0.0
   400  0.0             1.10000000D 00  1.09584820 00  0.0
 *FEV* F =  0.0             X =  1.93655270 00  5.73626720-01

    IZ     LOWER BOUND     UPPER BOUND      OCCUR(IZ)        PENALTY
     2 -1.00000000D 01  5.74764050D-01  5.73626720D-01  0.0
   400  0.0             1.10000000D 00  1.09584820 00  0.0
 *FEV*  F =  0.0            X =  1.93655270 00  5.73626720-01

 KRED =      0 ITERN =     -1

    IZ     LOWER BOUND     UPPER BOUND      OCCUR(IZ)        PENALTY
     2 -1.00000000D 01  5.16264050D-01  5.73626720D-01  3.29047620-03
```

```
 400  0.0                1.10000000 00  1.09584820 00  0.0
NFEVA  F =  3.2904762D-03 X =  1.93655270 00  5.73626720-01

NTRIA   N NSTAG NSUCC                      U
   1    1    0     0          0.0032904762
P(I) I = 1 TO  2
        1.9365527371          0.5736267237

IN ROSBRK DP =
 1       0.10000000D-01       0.0

P(I) I = 1 TO  2
        1.9465527D 00         5.7362672D-01

IN ROSBRK N =  1  E(N) =      0.1000000000D-01

 IZ       LOWER BOUND      UPPER BOUND      OCCUR(IZ)        PENALTY
   2 -1.00000000 01  5.16264050-01  5.73626720-01  3.29047620-03
 400  0.0               1.10000000 00  1.09831540 00  0.0
NFEVA  F =  3.29047620-03 X =  1.94655270 00  5.73626720-01

NTRIA   N NSTAG NSUCC                      U
   2    1    0     1          0.0032904762
P(I) I = 1 TO  2
        1.9465527371          0.5736267237

IN ROSBRK DP =
 1       0.30000000D-01       0.0

P(I) I = 1 TO  2
        1.9765527D 00         5.7362672D-01

IN ROSBRK N =  1  E(N) =      0.3000000000D-01

 IZ       LOWER BOUND      UPPER BOUND      OCCUR(IZ)        PENALTY
   2 -1.00000000 01  5.16264050-01  5.73626720-01  3.29047620-03
 400  0.0               1.10000000 00  1.10646700 00  4.18220990-05
NFEVA  F =  3.33234830-03 X =  1.97655270 00  5.73626720-01

NTRIA   N NSTAG NSUCC                      U
   3    1    0     1          0.0033322983
P(I) I = 1 TO  2
        1.9765527371          0.5736267237

IN ROSBRK DP =
 1       0.0                  0.10000000-01

P(I) I = 1 TO  2
        1.9465527D 00         5.83626720-01

IN ROSBRK N =  2  E(N) =      0.1000000000D-01

 IZ       LOWER BOUND      UPPER BOUND      OCCUR(IZ)        PENALTY
   2 -1.00000000 01  5.16264050-01  5.83626720-01  4.53772960-03
 400  0.0               1.10000000 00  1.09344910 00  0.0
NFEVA  F =  4.53772960-03 X =  1.94655270 00  5.83626720-01

NTRIA   N NSTAG NSUCC                      U
   4    2    0     0          0.0045377296
P(I) I = 1 TO  2
```

```
      1.9465527371        0.5836267237

 IN ROSBRK DP =
 1         0.0                -0.5000000D-02

 PLI) I = 1 TO  2
     1.9465527D 00        5.6862672D-01

 IN ROSBRK N =  2  E(N) =    -0.50000000000D-02

    IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
     2 -1.00000000 01   5.16264050-01   5.68626720-01   2.74184950-03
   400  0.0              1.10000000 00   1.10079540 00   6.32669410-07
 AFEVA  F =  2.7424821D-03 X =  1.9465527D 00  5.6862672D-01

   NTRIA     N NSTAG NSUCC                   V
       5     2     0     1         0.0027424821
 PLI) I = 1 TO  2
      1.9465527371        0.5686267237

 IN ROSBRK DP =
 1         0.0                -0.1800000D-01

 PLI) I = 1 TO  2
     1.9465527D 00        5.5362672D-01

 IN ROSBRK N =  2  E(N) =    -0.15000000000D-01

    IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
     2 -1.00000000 01   5.16264050-01   5.53626720-01   1.39596930-03
   400  0.0              1.10000000 00   1.10842300 00   7.09468850-05
 AFEVA  F =  1.4468162D-03 X =  1.9465527D 00  5.5362672D-01

   NTRIA     N NSTAG NSUCC                   V
       6     2     0     2         0.0014669162
 PLI) I = 1 TO  2
      1.9465527371        0.5536267237

 IN ROSBRK DP =
 1         0.0                -0.4500000D-01

 PLI) I = 1 TO  2
     1.9465527D 00        5.0862672D-01

 IN ROSBRK N =  2  E(N) =    -0.45000000000D-01

    IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
     2 -1.00000000 01   5.16264050-01   5.08626720-01   0.0
   400  0.0              1.10000000 00   1.13299330 00   1.08855610-03
 AFEVA  F =  1.0885561D-03 X =  1.9465527D 00  5.0862672D-01

   NTRIA     N NSTAG NSUCC                   V
       7     2     0     3         0.0010885561
 PLI) I = 1 TO  2
      1.9465527371        0.5086267237

 IN ROSBRK DP =
 1         0.0                -0.1350000D 00
```

```
P(I) I = 1 TO  2
         1.94655270 00        3.73626720-01

IN ROSBRK N =  2  E(N) =   -0.13500000000 00

  IZ    LOWER BOUND    UPPER BOUND       OCCUR(IZ)        PENALTY
   2 -1.00000000D 01  5.16264050-01  3.73626720-01  0.0
 400  0.0             1.10000000 00  1.22180160 00  1.48575630-02
*FEV*  F =  1.48575630-02 X =  1.94655270 00  3.73626720-01

 NTRIA      N NSTAG NSUCC               U
     0      2     0     3     0.0148575631
 P(I) I = 1 TO  2
         1.9465527371        0.3736267237

 C MATRIX FROM GRAM
        0.1520571043        -0.9883716977
       -0.9883716977        -0.1520571043

 C MATRIX FROM ROSBRK

  1.520-01 -9.880-01
 -9.880-01 -1.520-01

 NTRIA      N NSTAG NSUCC               U
     0      1     1     0     0.0010885561
 P(I) I = 1 TO  2
         1.9465527371        0.5086267237

 IN ROSBRK DP =
 1       0.76028590-03       -0.49418580-02

 P(I) I = 1 TO  2
        1.94731300 00        5.03684870-01

 IN ROSBRK N =  1  E(N) =    0.50000000000-02

   IZ    LOWER BOUND     UPPER BOUND      OCCUR(IZ)        PENALTY
    2 -1.00000000D 01  5.16264050-01  5.03684870-01  0.0
  400  0.0             1.10000000 00  1.13607640 00  1.30164990-03
*FEV*  F =  1.30164990-03 X =  1.94731300 00  5.03684870-01

 NTRIA      N NSTAG NSUCC               U
     0      1     1     0     0.0013016499
 P(I) I = 1 TO  2
         1.9473130230        0.5036848652

 IN ROSBRK DP =
 1      -0.38014300-03        0.24709290-02

 P(I) I = 1 TO  2
        1.94617260 00        5.11097650-01

 IN ROSBRK N =  1  E(N) =   -0.25000000000-02

   IZ    LOWER BOUND     UPPER BOUND      OCCUR(IZ)        PENALTY
    2 -1.00000000D 01  5.16264050-01  5.11097650-01  0.0
  400  0.0             1.10000000 00  1.13146460 00  9.90017930-04
 *FEV*  F =  9.90017930-04 X =  1.94617260 00  5.11097650-01
```

```
 NTRIA      N NSTAG NSUCC                    U
    10      1     1     1        0.0000900170
 P(I) I = 1 TO  2
          1.9461725941        0.5110976530

 IN ROSBRK DP =
 1       -0.11404290-02       0.74127880-02

 P(I) I = 1 TO  2
          1.94503220 00      5.18510440-01

 IN ROSBRK N =   1  E(N) =   -0.75000000000-02

    IE     LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
     2 -1.00000000D 01  5.16264050-01   5.18510440-01   5.04626510-06
   400  0.0             1.10000000 00   1.12692370 00   7.25424610-04
 *FEV*  F =  7.30470880-04 X =  1.94503220 00   5.18510440-01

 NTRIA      N NSTAG NSUCC                    U
    11      1     1     2        0.0007304700
 P(I) I = 1 TO  2
          1.9450321652        0.5185104407

 IN ROSBRK DP =
 1       -0.34212870-02       0.22238360-01

 P(I) I = 1 TO  2
          1.94161090 00      5.40748800-01

 IN ROSBRK N =   1  E(N) =   -0.22500000000-01

    IE     LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
     2 -1.00000000D 01  5.16264050-01   5.40748800-01   5.99503110-04
   400  0.0             1.10000000 00   1.11383910 00   1.91521760-04
 *FEV*  F =  7.91024870-04 X =  1.94161090 00   5.40748800-01

 NTRIA      N NSTAG NSUCC                    U
    12      1     1     2        0.0007910249
 P(I) I = 1 TO  2
          1.9416108786        0.5407488039

 IN ROSBRK DP =
 1        0.32122060-01       0.49418580-02

 P(I) I = 1 TO  2
          1.97715420 00      5.23452300-01

 IN ROSBRK N =   2  E(N) =   -0.32500000000-01

    IE     LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
     2 -1.00000000D 01  5.16364050-01   5.23452300-01   5.16709070-05
   400  0.0             1.10000000 00   1.13409700 00   1.16260240-03
 *FEV*  F =  1.21427330-03 X =  1.97715420 00   5.23452300-01

 NTRIA      N NSTAG NSUCC                    U
    13      2     1     0        0.0012142733
 P(I) I = 1 TO  2
          1.9771542454        0.5234522992
```

```
IN ROSBRK DP =
1      -0.1606104D-01      0.2470929D-02

P(I) I = 1 TO  2
        1.9289711D 00       5.1603951D-01

IN ROSBRK N =  2  E(N) =     0.1625000000D-01

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)        PENALTY
   2 -1.0000000D 01  5.1626405D-01  5.1603951D-01  0.0
 400  0.0            1.1000000D 00  1.1237579D 00  5.6443819D-04
#FEV#  F =  5.6443819D-04 X =  1.9289711D 00  5.1603951D-01

 NTRIA      N NSTAG NSUCC                U
   14       2    1     1         0.0005644382
P(I) I = 1 TO  2
          1.9289711251         0.5160395115

IN ROSBRK DP =
1      -0.4818513D-01     -0.7412788D-02

P(I) I = 1 TO  2
        1.8807880D 00       5.0862672D-01

IN ROSBRK N =  2  E(N) =     0.4875000000D-01

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)        PENALTY
   2 -1.0000000D 01  5.1626405D-01  5.0862672D-01  0.0
 400  0.0            1.1000000D 00  1.1158538D 00  2.5134317D-04
#FEV#  F =  2.5134317D-04 X =  1.8807880D 00  5.0862672D-01

 NTRIA      N NSTAG NSUCC                U
   15       2    1     2         0.0002513432
P(I) I = 1 TO  2
          1.8807880049         0.5086267237

IN ROSBRK DP =
1      -0.1448494D 00     -0.2223836D-01

P(I) I = 1 TO  2
        1.7362386D 00       4.8638836D-01

IN ROSBRK N =  2  E(N) =     0.1462500000D 00

  IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)        PENALTY
   2 -1.0000000D 01  5.1626405D-01  4.8638836D-01  0.0
 400  0.0            1.1000000D 00  1.1067512D 00  4.5578416D-05
#FEV#  F =  4.5578416D-05 X =  1.7362386D 00  4.8638836D-01

 NTRIA      N NSTAG NSUCC                U
   16       2    1     3         0.0000455784
P(I) I = 1 TO  2
          1.7362386441         0.4863883605

IN ROSBRK DP =
1      -0.4336481D 00     -0.6671509D-01

P(I) I = 1 TO  2
        1.3025906D 00       4.196[illegible]27D-01
```

```
IN ROSBRK N =  2  E(N) =     0.43875000000 00

  IZ     LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
   2 -1.00000000D-01   5.16264050D-01   4.19673270D-01   0.0
 400   0.0              1.10000000 00   1.2109304D 00   1.2305552D-02
#FEVA   F =  1.2305552D-02 X =   1.3025906D 00   4.1967327D-01

   NTRIA      N NSTAG NSUCC                        U
     17       2     1     3          0.0123055524
 P(I) I = 1 TO  2
          1.3025905618           0.4196732709

C MATRIX FROM GRAM
          -0.9944560968           0.1051526103
          -0.1051526103          -0.9944560968

C MATRIX FROM ROSBRK

 -9.940-01   1.050-01
 -1.050-01  -9.940-01

   NTRIA      N NSTAG NSUCC                        U
     17       1     2     0          0.0000455784
 P(I) I = 1 TO  2
          1.7362386441           0.4863883605

IN ROSBRK DP =
 1        0.49722800D-02         0.52576310D-03

 P(I) I = 1 TO  2
          1.74121090 00          4.86914120-01

IN ROSBRK N =  1  E(N) =    -0.50000000000D-02

  IZ     LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
   2 -1.00000000 01   5.16264050D-01   4.86914120-01   0.0
 400   0.0              1.10000000 00   1.1068073D 00   4.6339322D-05
#FEVA   F =  4.6339322D-05 X =  1.7412109D 00   4.8691412D-01

   NTRIA      N NSTAG NSUCC                        U
     18       1     2     0          0.0000463393
 P(I) I = 1 TO  2
          1.7412109246           0.4869141236

IN ROSBRK DP =
 1       -0.24861400-02        -0.26288150-03

 P(I) I = 1 TO  2
          1.73375250 00          4.86125480-01

IN ROSBRK N =  1  E(N) =     0.25000000000-02

  IZ     LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
   2 -1.00000000 01   5.16264050-01   4.86125480-01   0.0
 400   0.0              1.10000000 00   1.1067334D 00   4.53382300-05
#FEVA   F =  4.53382300-05 X =  1.73375250 00   4.86125480-01

   NTRIA      N NSTAG NSUCC                        U
     19       1     2     1          0.0000453382
 P(I) I = 1 TO  2
```

```
        1.7337525039          0.4861254790

  IN ROSBRK DP =
  1       -0.7458421D-02        -0.7886446D-03

  P(I) I = 1 TO 2
        1.7262941D 00         4.8533683D-01

  IN ROSBRK N =  1  E(N) =     0.7500000000D-02

    IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
     2  -1.00000000D 01   5.16264050D-01   4.85336830D-01   0.0
   400   0.0              1.10000000D 00   1.10672090D 00   4.5170821D-05
  *FEV*  F =  4.5170821D-05 X =  1.7262941D 00  4.8533683D-01

  NTRIA     N NSTAG NSUCC                     U
    20      1   2     2           0.0000451708
  P(I) I = 1 TO 2
        1.7262940831          0.4853368344

  IN ROSBRK DP =
  1       -0.2237526D-01        -0.2365934D-02

  P(I) I = 1 TO 2
        1.7039188D 00         4.8297090D-01

  IN ROSBRK N =  1  E(N) =     0.2250000000D-01

    IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
     2  -1.00000000D 01   5.16264050D-01   4.82970900D-01   0.0
   400   0.0              1.10000000D 00   1.10705250D 00   4.9738212D-05
  *FEV*  F =  4.9738212D-05 X =  1.7039188D 00  4.8297090D-01

  NTRIA     N NSTAG NSUCC                     U
    21      1   2     2           0.0000497382
  P(I) I = 1 TO 2
        1.7039188210          0.4829709007

  IN ROSBRK DP =
  1        0.1110674D-01        -0.1050394D 00

  P(I) I = 1 TO 2
        1.7374008D 00         3.8029741D-01

  IN ROSBRK N =  2  E(N) =     0.1056250000D 00

    IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)        PENALTY
     2  -1.00000000D 01   5.16264050D-01   3.80297410D-01   0.0
   400   0.0              1.10000000D 00   1.16106850D 00   3.7293587D-03
  *FEV*  F =  3.7293587D-03 X =  1.7374008D 00  3.8029741D-01

  NTRIA     N NSTAG NSUCC                     U
    22      2   2     0           0.0037293587
  P(I) I = 1 TO 2
        1.7374008276          0.3802974092

  IN ROSBRK DP =
  1       -0.5553372D-02         0.5251971D-01
```

```
P(I) I = 1 TO  2
        1.7207407D 00         5.3785655D-01

IN ROSBRK N =  2  E(N) =   -0.52812500000-01

   IZ   LOWER BOUND    UPPER BOUND      OCCUR(IZ)       PENALTY
    2 -1.0000000D 01  5.1626405D-01  5.3785655D-01  4.6623587D-04
  400  0.0            1.1000000D 00  1.0856331D 00  0.0
*FEV*  F =  4.6623587D-04 X =  1.7207407D 00  5.3785655D-01

  NTRIA      N NSTAG NSUCC                  U
     23      2     2     0         0.0004662359
P(I) I = 1 TO  2
        1.7207407109          0.5378565470

IN ROSBRK DP =
 I        0.2776686D-02        -0.2625986D-01

P(I) I = 1 TO  2
        1.7290708D 00         4.5907698D-01

IN ROSBRK N =  2  E(N) =    0.26406250000-01

   IZ   LOWER BOUND    UPPER BOUND      OCCUR(IZ)       PENALTY
    2 -1.0000000D 01  5.1626405D-01  4.5907698D-01  0.0
  400  0.0            1.1000000D 00  1.1188363D 00  3.5480746D-04
*FEV*  F =  3.5480746D-04 X =  1.7290708D 00  4.5907698D-01

  NTRIA      N NSTAG NSUCC                  U
     24      2     2     0         0.0003548075
P(I) I = 1 TO  2
        1.7290707483          0.4590769781

IN ROSBRK DP =
 I       -0.1388343D-02         0.1312993D-01

P(I) I = 1 TO  2
        1.7249057D 00         4.9846676D-01

IN ROSBRK N =  2  E(N) =   -0.13203125000-01

   IZ   LOWER BOUND    UPPER BOUND      OCCUR(IZ)       PENALTY
    2 -1.0000000D 01  5.1626405D-01  4.9846676D-01  0.0
  400  0.0            1.1000000D 00  1.1010311D 00  1.0631445D-06
*FEV*  F =  1.0631445D-06 X =  1.7249057D 00  4.9846676D-01

  NTRIA      N NSTAG NSUCC                  U
     25      2     2     1         0.0000010631
P(I) I = 1 TO  2
        1.7249057401          0.4984667624

IN ROSBRK DP =
 I       -0.4165029D-02         0.3938978D-01

P(I) I = 1 TO  2
        1.7207407D 00         5.3785655D-01

IN ROSBRK N =  2  E(N) =   -0.39609375000-01
```

```
   IZ    LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
    2 -1.00000000 01  5.16264050-01  5.37856550-01  4.66235870-04
  400  0.0             1.10000000 00  1.08543310 00  0.0
 *FEVA  F =  4.66235870-04 X =  1.72074070 00  5.37856550-01

  NTRIA      N NSTAG NSUCC                       U
     26      2     2     1           0.0004662359
  P(I) I = 1 TO  2
          1.7207407109          0.5378565470

  C MATRIX FROM GRAM
          -0.6842431970          0.7292538977
           0.7292538977          0.6842431970

  C MATRIX FROM ROSBRK

  -6.840-01  7.290-01
  -7.290-01  6.840-01

  NTRIA      N NSTAG NSUCC                       U
     26      1     3     0           0.0000010631
  P(I) I = 1 TO  2
          1.7249057401          0.4984667626

  IN ROSBRK DP =
  1        -0.34212160-02          0.34462690-02

  P(I) I = 1 TO  2
          1.72148450 00         5.02113030-01

  IN ROSBRK N =  1  E(N) =      0.50000000000-02

   IZ    LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
    2 -1.00000000 01  5.16264050-01  5.02113030-01  0.0
  400  0.0             1.10000000 00  1.09941200 00  0.0
 *FEVA  F =  0.0              X =  1.72148450 00  5.02113030-01

   IZ    LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
    2 -1.00000000 01  5.16264050-01  5.02113030-01  0.0
  400  0.0             1.10000000 00  1.09941200 00  0.0
 *FEV*  F =  0.0              X =  1.72148450 00  5.02113030-01

  KRED =       0 ITERN =      -1

   IZ    LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
    2 -1.00000000 01  4.51901730-01  5.02113030-01  2.52117500-03
  400  0.0             1.10000000 00  1.09941200 00  0.0
 *FEV*  F =  2.52117500-03 X =  1.72148450 00  5.02113030-01

  NTRIA      N NSTAG NSUCC                       U
      1      1     0     0           0.0025211750
  P(I) I = 1 TO  2
          1.7214845241          0.5021130321

  IN ROSBRK DP =
  1        0.10000000-01          0.0

  P(I) I = 1 TO  2
         1.73148450 00         5.02113030-01
```

```
IN ROSBRK N =  1  E(N) =     0.10000000000-01

  IZ     LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
   2  -1.00000000D 01   4.51901730D-01   5.02113030D-01   2.52117500D-03
 400   0.0              1.10000000D 00   1.09972720D 00   0.0
 #FEVA  F =  2.52117500D-03 X =  1.73148450D 00   5.02113030D-01

   NTRIA     N NSTAG NSUCC                    U
       2     1     0     1          0.0025211750
 P(I) I = 1 TO  2
          1.7314845241            0.5021130321

 IN ROSBRK DP =
  1         0.30000000D-01          0.0

 P(I) I = 1 TO  2
          1.76148450 00          5.02113030D-01

 IN ROSBRK N =  1  E(N) =     0.30000000000D-01

  IZ     LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
   2  -1.00000000D 01   4.51901730D-01   5.02113030D-01   2.52117500D-03
 400   0.0              1.10000000D 00   1.10142290D 00   2.02451730D-06
 #FEVA  F =  2.52319950D-03 X =  1.76148450 00   5.02113030D-01

   NTRIA     N NSTAG NSUCC                    U
       3     1     0     1          0.0025231995
 P(I) I = 1 TO  2
          1.7614845241            0.5021130321

 IN ROSBRK DP =
  1         0.0                     0.10000000D-01

 P(I) I = 1 TO  2
          1.73148450 00          5.12113030D-01

 IN ROSBRK N =  2  E(N) =     0.10000000000D-01

  IZ     LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
   2  -1.00000000D 01   4.51901730D-01   5.12113030D-01   3.62540100D-03
 400   0.0              1.10000000D 00   1.09558000D 00   0.0
 #FEVA  F =  3.62540100D-03 X =  1.73148450 00   5.12113030D-01

   NTRIA     N NSTAG NSUCC                    U
       4     2     0     0          0.0036254010
 P(I) I = 1 TO  2
          1.7314845241            0.5121130321

 IN ROSBRK DP =
  1         0.0                    -0.50000000D-02

 P(I) I = 1 TO  2
          1.73148450 00          4.97113030D-01

 IN ROSBRK N =  2  E(N) =    -0.50000000000D-02

  IZ     LOWER BOUND      UPPER BOUND        OCCUR(IZ)          PENALTY
   2  -1.00000000D 01   4.51901730D-01   4.97113030D-01   2.04406190D-03
 400   0.0              1.10000000D 00   1.10184770D 00   3.41404860D-06
 #FEVA  F =  2.04747600D-03 X =  1.73148450 00   4.97113030D-01
```

```
 NTRIA      N NSTAG NSUCC                U
   5        2    0     1          0.0020474760
 P(I) I = 1 TO  2
            1.7314845241          0.4971130321

 IN ROSBRK DP =
 1          0.0                  -0.15000000D-01

 P(I) I = 1 TO  2
            1.73148450D 00        4.02113030D-01

 IN ROSBRK N =  2  E(N) =  -0.15000000000D-01

    IZ      LOWER BOUND      UPPER BOUND       OCCUR(IZ)        PENALTY
    2 -1.00000000D 01   4.51901730D-01   4.82113030D-01   9.12722840D-04
  400  0.0              1.10000000D 00   1.10839670D 00   7.05040830D-05
 *FEV*  F =  9.83226920D-04 X =  1.73148450D 00   4.82113030D-01

 NTRIA      N NSTAG NSUCC                U
   6        2    0     2          0.0009832269
 P(I) I = 1 TO  2
            1.7314845241          0.4821130321

 IN ROSBRK DP =
 1          0.0                  -0.45000000D-01

 P(I) I = 1 TO  2
            1.73148450D 00        4.37113030D-01

 IN ROSBRK N =  2  E(N) =  -0.45000000000D-01

    IZ      LOWER BOUND      UPPER BOUND       OCCUR(IZ)        PENALTY
    2 -1.00000000D 01   4.51901730D-01   4.37113030D-01   0.0
  400  0.0              1.10000000D 00   1.12973100D 00   8.83934780D-04
 *FEV*  F =  8.83934780D-04 X =  1.73148450D 00   4.37113030D-01

 NTRIA      N NSTAG NSUCC                U
   7        2    0     3          0.0008839348
 P(I) I = 1 TO  2
            1.7314845241          0.4371130321

 IN ROSBRK DP =
 1          0.0                  -0.13500000D 00

 P(I) I = 1 TO  2
            1.73148450D 00        3.02113030D-01

 IN ROSBRK N =  2  E(N) =  -0.13500000000D 00

    IZ      LOWER BOUND      UPPER BOUND       OCCUR(IZ)        PENALTY
    2 -1.00000000D 01   4.51901730D-01   3.02113030D-01   0.0
  400  0.0              1.10000000D 00   1.20892160D 00   1.18639260D-02
 *FEV*  F =  1.18639260D-02 X =  1.73148450D 00   3.02113030D-01

 NTRIA      N NSTAG NSUCC                U
   8        2    0     3          0.0118639257
 P(I) I = 1 TO  2
            1.7314845241          0.3021130321
```

```
C MATRIX FROM GRAM
          0.1520571843         -0.9883716977
         -0.9883716977         -0.1520571843

C MATRIX FROM ROSBRK

  1.52D-01 -9.88D-01
 -9.88D-01 -1.52D-01

  NTRIA      N NSTAG NSUCC                      U
      8      1     1     0          0.0008839348
 P(I) I = 1 TO  2
         1.7314845241          0.4371130321

 IN ROSBRK DP =
 1          0.7602859D-03       -0.4941856D-02

 P(I) I = 1 TO  2
         1.7322448D 00         4.3217117D-01

 IN ROSBRK N =  1  E(N) =      0.5000000000D-02

    IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
     2 -1.0000000D-01   4.5190173D-01    4.3217117D-01   0.0
   400  0.0             1.1000000D 00    1.1322972D 00   1.0431075D-03
 NFEVA  F =  1.0431075D-03 X =  1.7322448D 00   4.3217117D-01

  NTRIA      N NSTAG NSUCC                      U
      9      1     1     0          0.0010431075
 P(I) I = 1 TO  2
         1.7322448100          0.4321711736

 IN ROSBRK DP =
 1         -0.3801430D-03        0.2470929D-02

 P(I) I = 1 TO  2
         1.7311044D 00         4.3958396D-01

 IN ROSBRK N =  1  E(N) =     -0.2500000000D-02

    IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
     2 -1.0000000D 01   4.5190173D-01    4.3958396D-01   0.0
   400  0.0             1.1000000D 00    1.1284618D 00   8.1007439D-04
 NFEVA  F =  8.1007439D-04 X =  1.7311044D 00   4.3958396D-01

  NTRIA      N NSTAG NSUCC                      U
     10      1     1     1          0.0008100744
 P(I) I = 1 TO  2
         1.7311043811          0.4395839613

 IN ROSBRK DP =
 1         -0.1140429D-02        0.7412788D-02

 P(I) I = 1 TO  2
         1.7299640D 00         4.4699675D-01

 IN ROSBRK N =  1  E(N) =     -0.7500000000D-02

    IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
     2 -1.0000000D 01   4.5190173D-01    4.4699675D-01   0.0
```

```
  400  0.0               1.10000000 00  1.12470940 00  6.10555930-04
  NFEVA  F =  6.10555930-04 X =  1.72996400 00  4.46996750-01

  NTRIA     N NSTAG NSUCC                  U
    11      1    1     2          0.0006105559
  P(I) I = 1 TO  2
         1.7299639523          0.4469967490

  IN ROSBRK DP =
  1        -0.34212870-02          0.22238360-01

  P(I) I = 1 TO  2
         1.72654270 00         4.69235110-01

  IN ROSBRK N =  1  F(N) =     -0.22500000000-01

     IZ    LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
      2 -1.00000000 01   4.51901730-01   4.69235110-01   3.00446180-04
  400  0.0               1.10000000 00   1.11395030 00   1.94609790-04
  NFEVA  F =  4.95056070-04 X =  1.72654270 00  4.69235110-01

  NTRIA     N NSTAG NSUCC                  U
    12      1    1     3          0.0004950560
  P(I) I = 1 TO  2
         1.7265426656          0.4692351122

  IN ROSBRK DP =
  1        -0.10263860-01          0.66715090-01

  P(I) I = 1 TO  2
         1.71627880 00         5.35950200-01

  IN ROSBRK N =  1  F(N) =     -0.67500000000-01

     IZ    LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
      2 -1.00000000 01   4.51901730-01   5.35950200-01   7.06414580-03
  400  0.0               1.10000000 00   1.08615440 00   0.0
  NFEVA  F =  7.06414580-03 X =  1.71627880 00  5.35950200-01

  NTRIA     N NSTAG NSUCC                  U
    13      1    1     3          0.0070641458
  P(I) I = 1 TO  2
         1.7162788057          0.5359502018

  IN ROSBRK DP =
  1         0.32122080-01          0.49418580-02

  P(I) I = 1 TO  2
         1.75866470 00         4.74176970-01

  IN ROSBRK N =  2  E(N) =     -0.32500000000-01

     IZ    LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
      2 -1.00000000 01   4.51901730-01   4.74176970-01   4.96186400-04
  400  0.0               1.10000000 00   1.11403310 00   1.96928630-04
  NFEVA  F =  6.93115030-04 X =  1.75866470 00  4.74176970-01

  NTRIA     N NSTAG NSUCC                  U
    14      2    1     0          0.0006931150
  P(I) I = 1 TO  2
```

```
          1.7566647458          0.4741769707

  IN ROSBRK DP =
   1       -0.1606104D-01       -0.2470929D-02

  P(I) I = 1 TO  2
          1.7104816D 00        4.6676418D-01

  IN ROSBRK N =  2  E(N) =     0.1625000000D-01

     IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
      2  -1.0000000D 01   4.5190173D-01   4.6676418D-01   2.2089254D-04
    400   0.0              1.1000000D 00   1.1143147D 00   2.0490930D-04
  AEEVA   F =  4.2580184D-04  X =  1.7104816D 00   4.6676418D-01

    NTRIA      N NSTAG NSUCC                    U
      15       2     1     1         0.0004258018
  P(I) I = 1 TO  2
          1.7104816255          0.4667641830

  IN ROSBRK DP =
   1       -0.4818312D-01       -0.7412788D-02

  P(I) I = 1 TO  2
          1.6622985D 00        4.5935140D-01

  IN ROSBRK N =  2  E(N) =     0.4875000000D-01

     IZ     LOWER BOUND     UPPER BOUND       OCCUR(!Z)          PENALTY
      2  -1.0000000D 01   4.5190173D-01   4.5935140D-01   5.5497530D-05
    400   0.0              1.1000000D 00   1.1170311D 00   2.9005928D-04
  AEEVA   F =  3.4555681D-04  X =  1.6622985D 00   4.5935140D-01

    NTRIA      N NSTAG NSUCC                    U
      16       2     1     2         0.0003455568
  P(I) I = 1 TO  2
          1.6622985053          0.4593513953

  IN ROSBRK DP =
   1       -0.1445494D 00       -0.2223836D-01

  P(I) I = 1 TO  2
          1.5177491D 00        4.3711303D-01

  IN ROSBRK N =  2  E(N) =     0.1462500000D 00

     IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)          PENALTY
      2  -1.0000000D 01   4.5190173D-01   4.3711303D-01   0.0
    400   0.0              1.1000000D 00   1.1397902D 00   1.5832620D-03
  AEEVA   F =  1.5832620D-03  X =  1.5177491D 00   4.3711303D-01

    NTRIA      N NSTAG NSUCC                    U
      17       2     1     2         0.0015832620
  P(I) I = 1 TO  2
          1.5177491445          0.4371130321

  C MATRIX FROM GRAM
         -0.9520285613        -0.3060091804
          0.3060091804        -0.9520285613
```

```
C MATRIX FROM ROSBRK

-9.52D-01 -3.06D-01
 3.06D-01 -9.52D-01

  NTRIA      N NSTAG NSUCC                    U
   17        1    2     0         0.0003455568
  PIII I = 1 TO  2
        1.6622985053          0.4593513953

  IN ROSBRK DP =
  1         0.15470460-01       -0.49726490-02

  PIII I = 1 TO  2
        1.67776900 00         4.54378750-01

  IN ROSBRK N =  1  E(N) =    -0.16250000000-01

     IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)       PENALTY
      2  -1.00000000 01   4.51901730-01   4.54378750-01   6.13561430-06
    400   0.0             1.10000000 00   1.11909750 00   3.64716200-04
  #FEV#  F =  3.70851820-04 X =  1.67776900 00  4.54378750-01

  NTRIA      N NSTAG NSUCC                    U
   18        1    2     0         0.0003708518
  PIII I = 1 TO  2
        1.6777689694          0.4543787461

  IN ROSBRK DP =
  1        -0.77352320-02        0.24863250-02

  PIII I = 1 TO  2
        1.65456330 00         4.61837720-01

  IN ROSBRK N =  1  E(N) =     0.81250000000-02

     IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)       PENALTY
      2  -1.00000000 01   4.51901730-01   4.61837720-01   9.87239170-05
    400   0.0             1.10000000 00   1.11616500 00   2.61306260-04
  #FEV#  F =  3.60030180-04 X =  1.65456330 00  4.61837720-01

  NTRIA      N NSTAG NSUCC                    U
   19        1    2     0         0.0003600302
  PIII I = 1 TO  2
        1.6545632732          0.4618377199

  IN ROSBRK DP =
  1         0.38676160-02       -0.13431620-02

  PIII I = 1 TO  2
        1.66616610 00         4.58108230-01

  IN ROSBRK N =  1  F(N) =    -0.40625000000-02

     IZ     LOWER BOUND    UPPER BOUND       OCCUR(IZ)       PENALTY
      2  -1.00000000 01   4.51901730-01   4.58108230-01   3.85206930-05
    400   0.0             1.10000000 00   1.11750600 00   3.06458930-04
  #FEV#  F =  3.44979620-04 X =  1.66616610 00  4.58108230-01
```

```
 NTRIA       N NSTAG NSUCC                       U
    20       1    2     1          0.0003449796
 P(I) I = 1 TO  2
             1.6661661213          0.4581082330

 IN ROSBRK OP =
 1          0.11602850-01        -0.37294870-02

 P(I) I = 1 TO  2
             1.67776900 00        4.54378750-01

 IN ROSBRK N =   1  E(N) =  -0.1218750000D-01

   IZ     LOWER BOUND     UPPER BOUND      OCCUR(IZ)        PENALTY
    2 -1.00000000 01   4.51901730-01   4.54378750-01   6.13561430-06
  400  0.0             1.10000000 00   1.11909750 00   3.64716200-04
 *FEV*   F =   3.70851820-04 X =   1.67776900 00   4.54378750-01

 NTRIA       N NSTAG NSUCC                       U
    21       1    2     1          0.0003708518
 P(I) I = 1 TO  2
             1.6777689694          0.4543787461

 IN ROSBRK OP =
 1         -0.99452980-02        -0.30940930-01

 P(I) I = 1 TO  2
             1.65622080 00        4.27167   -01

 IN ROSBRK N =   2  E(N) =   0.3250000000D-01

   IZ     LOWER BOUND     UPPER BOUND      OCCUR(IZ)        PENALTY
    2 -1.00000000 01   4.51901730-01   4.27167300-01   0.0
  400  0.0             1.10000000 00   1.13125490 00   9.76870190-04
 *FEV*   F =   9.76870190-04 X =   1.65622090 00   4.27167300-01

 NTRIA       N NSTAG NSUCC                       U
    22       2    2     0          0.0009768702
 P(I) I = 1 TO  2
             1.6562208229          0.4271673047

 IN ROSBRK OP =
 1          0.49726490-02         0.15470460-01

 P(I) I = 1 TO  2
             1.67113880 00        4.73578700-01

 IN ROSBRK N =   2  E(N) =  -0.1625000000D-01

   IZ     LOWER BOUND     UPPER BOUND      OCCUR(IZ)        PENALTY
    2 -1.00000000 01   4.51901730-01   4.73578700-01   4.69890950-04
  400  0.0             1.10000000 00   1.11095350 00   1.19979550-04
 *FEV*   F =   5.89870500-04 X =   1.67113880 00   4.73578700-01

 NTRIA       N NSTAG NSUCC                       U
    23       2    2     0          0.0005898705
 P(I) I = 1 TO  2
             1.6711387705          0.4735786971
```

```
IN ROSBRK DP =
  1       -0.24863280-02       -0.77352320-02

 P(I) I = 1 TO  2
          1.66367980 00        4.50373000-01

 IN ROSBRK N =  2  E(N) =     0.81250000000-02

    IZ      LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
     2 -1.00000000 01   4.51901730-01   4.50373000-01   0.0
   400  0.0              1.10000000 00   1.12086270 00   4.35252260-04
 *FEV*  F =  4.35252260-04 X =  1.66367980 00   4.50373000-01

     NTRIA       N NSTAG NSUCC                  U
       24        2    2     0           0.0004352523
 P(I) I = 1 TO  2
          1.6636797967         0.4503730009

 IN ROSBRK DP =
  1        0.13481420-02        0.38674160-02

 P(I) I = 1 TO  2
          1.66740930 00        4.61975850-01

 IN ROSBRK N =  2  E(N) =    -0.40625000000-02

    IZ      LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
     2 -1.00000000 01   4.51901730-01   4.61975850-01   1.01487900-04
   400  0.0              1.10000000 00   1.11584770 00   2.51150510-04
 *FEV*  F =  3.52638410-04 X =  1.66740930 00   4.61975850-01

     NTRIA       N NSTAG NSUCC                  U
       25        2    2     0           0.0003526384
 P(I) I = 1 TO  2
          1.6674092836         0.4619758490

 IN ROSBRK DP =
  1       -0.42158110-03       -0.14938080-02

 P(I) I = 1 TO  2
          1.66554450 00        4.56174420-01

 IN ROSBRK N =  2  E(N) =     0.20312500000-02

    IZ      LOWER BOUND     UPPER BOUND        OCCUR(IZ)          PENALTY
     2 -1.00000000 01   4.51901730-01   4.56174420-01   1.82559320-05
   400  0.0              1.10000000 00   1.11834010 00   3.36359990-04
 *FEV*  F =  3.54615920-04 X =  1.66554450 00   4.56174420-01

     NTRIA       N NSTAG NSUCC                  U
       26        2    2     0           0.0003546159
 P(I) I = 1 TO  2
          1.6655445401         0.4561744250

 IN ROSBRK DP =
  1        0.31079060-03        0.94490400-03

 P(I) I = 1 TO  2
          1.66647690 00        4.59075140-01
```

```
IN ROSBRK N =  2  E(N) =    -0.1015625000D-02

   IZ     LOWER BOUND     UPPER BOUND      OCCUR(IZ)        PENALTY
    2 -1.00000000D 01  4.51901730D-01  4.59075140D-01  5.14577840D-05
  400  0.0             1.10000000D 00  1.11709020D 00  2.92073240D-04
 #FEVA  F =  3.43531030D-04 X =  1.66647690D 00  4.59075140D-01

  NTRIA     N NSTAG NSUCC                 U
    27      2   2     1        0.0003435310
 P(I) I = 1 TO  2
          1.6664769119          0.4990751370

 IN ROSBRK DP =
 1          0.93227170D-03         0.28007120D-02

 P(I) I = 1 TO  2
         1.66740930D 00         4.61975850D-01

 IN ROSBRK N =  2  E(N) =    -0.3046875000D-02

   IZ     LOWER BOUND     UPPER BOUND      OCCUR(IZ)        PENALTY
    2 -1.00000000D 01  4.51901730D-01  4.61975850D-01  1.01487900D-04
  400  0.0             1.10000000D 00  1.11584770D 00  2.51150510D-04
 #FEVA  F =  3.52638410D-04 X =  1.66740930D 00  4.61975850D-01

  NTRIA     N NSTAG NSUCC                 U
    28      2   2     1        0.0003526384
 P(I) I = 1 TO  2
          1.6674092836          0.4619758490

 C MATRIX FROM GRAM
          0.9978214965          0.0659716692
         -0.0659716692          0.9978214965

 C MATRIX FROM ROSBRK

  9.980D-01  6.600D-02
 -6.600D-02  9.980D-01

  NTRIA     N NSTAG NSUCC                 U
    28      1   3     0        0.0003435310
 P(I) I = 1 TO  2
          1.6664769119          0.4990751370

 IN ROSBRK DP =
 1         -0.20268250D-02         0.13400500D-03

 P(I) I = 1 TO  2
         1.66445010D 00         4.59209140D-01

 IN ROSBRK N =  1  E(N) =    -0.2031250000D-02

   IZ     LOWER BOUND     UPPER BOUND      OCCUR(IZ)        PENALTY
    2 -1.00000000D 01  4.51901730D-01  4.59209140D-01  5.33982860D-05
  400  0.0             1.10000000D 00  1.11705860D 00  2.90994680D-04
 #FEVA  F =  3.44392960D-04 X =  1.66445010D 00  4.59209140D-01

  NTRIA     N NSTAG NSUCC                 U
    29      1   3     0        0.0003443930
 P(I) I = 1 TO  2
```

```
        1.6644500869        0.4592091419

 IN ROSBRK  DP =
  1      -0.10134120-02      -0.67002480-04

 P(I)  I = 1 TO  2
        1.66749030 00       4.59008130-01

 IN ROSBRK  N =  1   E(N) =     0.10156250000-02

   IZ      LOWER BOUND       UPPER BOUND      OCCUR(IZ)        PENALTY
    2  -1.00000000D-01    4.51901730-01    4.59008130-01    5.05010010-05
  400   0.0               1.10000000D 00   1.11710800 00    2.92684670-04
 *FEV*   F =   3.43185680-04  X =   1.66749030 00    4.59008130-01

   NTRIA      N NSTAG NSUCC                 U
     30       1     3     1        0.0003431857
 P(I)  I = 1 TO  2
        1.6674903243        0.4590081345

 IN ROSBRK  DP =
  1      -0.30402370-02      -0.20100740-03

 P(I)  I = 1 TO  2
        1.67053060 00       4.58807130-01

 IN ROSBRK  N =  1   E(N) =     0.30468750000-02

   IZ      LOWER BOUND       UPPER BOUND      OCCUR(IZ)        PENALTY
    2  -1.00000000D-01    4.51901730-01    4.58807130-01    4.76845240-05
  400   0.0               1.10000000D 00   1.11717000 00    2.94809380-04
 *FEV*   F =   3.42493900-04  X =   1.67053060 00    4.58807130-01

   NTRIA      N NSTAG NSUCC                 U
     31       1     3     2        0.0003424939
 P(I)  I = 1 TO  2
        1.6705305617        0.4588071271

 IN ROSBRK  DP =
  1      -0.91207120-02      -0.60302230-03

 P(I)  I = 1 TO  2
        1.67965130 00       4.58204100-01

 IN ROSBRK  N =  1   E(N) =     0.91406250000-02

   IZ      LOWER BOUND       UPPER BOUND      OCCUR(IZ)        PENALTY
    2  -1.00000000D-01    4.51901730-01    4.58204100-01    3.97199420-05
  400   0.0               1.10000000D 00   1.11743110 00    3.03843000-04
 *FEV*   F =   3.43562940-04  X =   1.67965130 00    4.58204100-01

   NTRIA      N NSTAG NSUCC                 U
     32       1     3     2        0.0003435629
 P(I)  I = 1 TO  2
        1.6796512738        0.4582041048

 IN ROSBRK  DP =
  1      -0.33501240-04      -0.50670620-03
```

```
P(I) I = 1 TO  2
         1.67049710 00        4.58300420-01

IN ROSBRK N =  2  E(N) =    -0.50781250000-03

  IZ    LOWER BOUND     UPPER BOUND       OCCUR(IZ)         PENALTY
   2 -1.00000000D 01  4.5190173D-01  4.5830042D-01  4.0943259D-05
 400  0.0             1.10000000 00  1.11738790 00  3.0234030D-04
*FEV*  F =  3.4328356D-04 X =  1.67049710 00  4.5830042D-01

 NTRIA      N NSTAG NSUCC                    U
    33      2    3     0         0.0003432836
P(I) I = 1 TO  2
         1.6704970605         0.4583004208

IN ROSBRK DP =
1        0.1675062D-04        0.2633531D-03

P(I) I = 1 TO  2
         1.67054730 00        4.59060480-01

IN ROSBRK N =  2  E(N) =    0.25390625000-03

  IZ    LOWER BOUND     UPPER BOUND       OCCUR(IZ)         PENALTY
   2 -1.00000000D 01  4.5190173D-01  4.5906048D-01  5.1247721D-05
 400  0.0             1.10000000 00  1.11706120 00  2.91083320-04
*FEV*  F =  3.4233105D-04 X =  1.67054730 00  4.5906048D-01

 NTRIA      N NSTAG NSUCC                    U
    34      2    3     1         0.0003423311
P(I) I = 1 TO  2
         1.6705473123         0.4590604802

IN ROSBRK DP =
1        0.5025186D-04        0.7600593D-03

P(I) I = 1 TO  2
         1.67059760 00        4.59820540-01

IN ROSBRK N =  2  E(N) =    0.76171875000-03

  IZ    LOWER BOUND     UPPER BOUND       OCCUR(IZ)         PENALTY
   2 -1.00000000D 01  4.5190173D-01  4.5982054D-01  6.2707562D-05
 400  0.0             1.10000000 00  1.11673510 00  2.80062280-04
*FEV*  F =  3.4276984D-04 X =  1.67059760 00  4.5982054D-01

 NTRIA      N NSTAG NSUCC                    U
    35      2    3     1         0.0003427698
P(I) I = 1 TO  2
         1.6705975642         0.4598205395

C-MATRIX FROM GRAM
         0.9999935171         0.0036007997
        -0.0036007997         0.9999935171

C-MATRIX FROM ROSBRK

  1.000-00  3.600-03
 -3.60D-03  1.00C 00
```

```
 NTRIA      N NSTAG NSUCC                 U
    35      1     4     0         0.0003423311
P(I) I = 1 TO  2
         1.6705473123          0.4590604802

 IN ROSBRK DP =
1        0.2031237D-02       -0.7314124D-05

P(I) I = 1 TO  2
         1.67257850 00       4.5905317D-01

 IN ROSBRK N =  1  E(N) =    0.20312500000-02

   IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)         PENALTY
    2 -1.00000000D 01  4.5190173D-01  4.5905317D-01  5.1143054D-05
  400  0.0             1.10000000D 00  1.1170545D 00  2.9085527D-04
*FEV*  F =  3.41998320-04 X =  1.67257850 00   4.5905317D-01

 NTRIA      N NSTAG NSUCC                 U
    36      1     4     1         0.0003419983
P(I) I = 1 TO  2
         1.6725785491          0.4590531661

 IN ROSBRK DP =
1        0.6093710D-02       -0.2194237D-04

P(I) I = 1 TO  2
         1.67867730 00       4.5903122D-01

 IN ROSBRK N =  1  E(N) =    0.60937500000-02

   IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)         PENALTY
    2 -1.00000000D 01  4.5190173D-01  4.5903122D-01  5.0829696D-05
  400  0.0             1.10000000D 00  1.1170655D 00  2.9123138D-04
*FEV*  F =  3.42061080-04 X =  1.67867230 00   4.5903122D-01

 NTRIA      N NSTAG NSUCC                 U
    37      1     4     1         0.0003420611
P(I) I = 1 TO  2
         1.6786722596          0.4590312237

 IN ROSBRK DP =
1        0.4571328D-06        0.1269523D-03

P(I) I = 1 TO  2
         1.67257900 00       4.5918012D-01

 IN ROSBRK N =  2  E(N) =    0.12695312500-03

   IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)         PENALTY
    2 -1.00000000D 01  4.5190173D-01  4.5918012D-01  5.2974954D-05
  400  0.0             1.10000000D 00  1.1169998D 00  2.8899388D-04
*FEV*  F =  3.41968830-04 X =  1.67257900 00   4.5918012D-01

 NTRIA      N NSTAG NSUCC                 U
    38      2     4     1         0.0003419688
P(I) I = 1 TO  2
         1.6725790063          0.4591801184
```

```
IN ROSBRK DP =
1        0.13713080D-05        0.38085690D-03

P(I) I = 1 TO  2
         1.67258040D 00        4.59560980D-01

IN ROSBRK N =  2  E(N) =      0.38085937500D-03

  IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)         PENALTY
   2  -1.00000000D 01   4.51901730D-01   4.59560980D-01   5.86640560D-05
 400   0.0              1.10000000 00    1.11683600D 00   2.83449610D-04
*FEV*  F =  3.42113670D-04 X =  1.67258040D 00   4.59560980D-01

NTRIA     N NSTAG NSUCC                   U
  39      2    4     1         0.0003421137
P(I) I = 1 TO  2
         1.6725803777          0.4595609753

ROSBRK SEARCH IS COMPLETE.

FINAL PERFORMANCE FUNCTION.  ULAST =      0.34196682990D-03
FINAL PARAMETERS ARE
      0.16725790060D 01     0.45918011840D 00

NUMBER OF TRIALS =    39
NUMBER OF STAGES =     4

  IZ     LOWER BOUND     UPPER BOUND       OCCUR(IZ)         PENALTY
   2  -1.00000000D 01   4.51901730D-01   4.59180120D-01   5.79749540D-05
 400   0.0              1.10000000D 00   1.11699980D 00   2.38993880D-04
*FEV*  F =   3.41968830D-04 X =  1.67257900 00    4.59180120D-01

KRED =       1 ITERM =        0
```

```
                                                          18.02.03.76      11/07/68
INPUT CARDS READ                                                       2241-8   *DATA
DATA* CASE  8.0                                                        2241-8   *DATA
DATA*H ONE VARIABLE FIBONACCI EXAMPLE                                  2241-8   *DATA
DATA* MODE  3 ICON(1)  1 IREF  2 MOPT  5 A  0.625  -0.75  0.625  -1.75 2241-8   *DATA
DATA* 0.25 2.625 IPROC  1 LIMIT  12 IEX  1 OCCUR(2)  1.0 IN  1         2241-8   *DATA
DATA* IONO  1 ALOW  -10.0 UP  10.0 NCONS  1 INC  400 AMULT  1.0        2241-8   *DATA
DATA* CALOW  0.0 CTP  0.0                                                       *DATA
DATA* LREO  0                                                                   *DATA
DATA*1
```

```
ONE VARIABLE FIBONACCI EXAMPLE                                            2241-8

     IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
    400   0.0               0.0            1.28850480 01   1.28850480 01
  *FEV*   F =   1.28850480 01 X = -2.36074270 00

     IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
    400   0.0               0.0            1.08133460 00   1.08133460 00
  *FEV*   F =   1.08133460 00 X =  2.36074270 00

     IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
    400   0.0               0.0            7.71791120 00   7.71791120 00
  *FEV*   F =   7.71791120 00 X =  5.27851460 00

     IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
    400   0.0               0.0            2.30135300 00   2.30135300 00
  *FEV*   F =   2.30135300 00 X =  5.57029180-01

     IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
    400   0.0               0.0            2.35939890 00   2.35939890 00
  *FEV*   F =   2.35939890 00 X =  3.47480110 00

     IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
    400   0.0               0.0            1.06761460 00   1.06761460 00
  *FEV*   F =   1.06761460 00 X =  1.67108750 00

     IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
    400   0.0               0.0            1.35467780 00   1.35467780 00
  *FEV*   F =   1.35467780 00 X =  1.24668440 00

     IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
    400   0.0               0.0            1.00253290 00   1.00253290 00
  *FEV*   F =   1.00253290 00 X =  1.93633950 00

     IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
    400   0.0               0.0            1.00569900 00   1.00569900 00
  *FEV*   F =   1.00569900 00 X =  2.09549070 00

     IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
    400   0.0               0.0            1.01801180 00   1.01801180 00
  *FEV*   F =   1.01801180 00 X =  1.83023870 00

     IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
    400   0.0               0.0            1.00007040 00   1.00007040 00
  *FEV*   F =   1.00007040 00 X =  1.98938990 00

     IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
    400   0.0               0.0            1.00112570 00   1.00112570 00
  *FEV*   F =   1.00112570 00 X =  2.04244030 00

     IZ     LOWER BOUND     UPPER BOUND          OCCUR(IZ)          PENALTY
    400   0.0               0.0            1.00007040 00   1.00007040 00
  *FEV*   F =   1.00007040 00 X =  1.98938990 00

  KRED =      -1 ITERM =       0
```

```
INPUT CARDS READ                                   18.02.04.99   11/07/68
DATA*END-OF-JOB                                                   *DATA
```

```
IEF285I   SYS68312.T174300.RP002.P2542F.GOSET          PASSED
IEF285I   VOL SER NOS= SSSSSS.
IEF285I   SYS68312.T174300.RP002.P2542F.GOSET          DELETED
IEF285I   VOL SER NOS= SSSSSS.
IEF285I   SYSOUT                                       SYSOUT
IEF285I   VOL SER NOS=
IEF285I   SYS68312.T174300.RP002.P2542F.R0000005       DELETED
IEF285I   VOL SER NOS= SCR280.
IEF285I   SYS68312.T174300.RP002.P2542F.R0000006       DELETED
IEF285I   VOL SER NOS= EARL .
IEF285I   SYS68312.T174300.RP002.P2542F.R0000007       DELETED
IEF285I   VOL SER NOS= AWC001.
IEF280I K 184,EARL   ,P2542F
```

ROYAL BUSINESS FORMS INCORPORATED

```
ASP JOB NO. = 0042                                  11/07/68

//P2542F JOB (K143E510010,00000,116,030,LORRAINE,*************,K240),1',X

ELAPSED TIME ON MAIN = SY1      = 00.321 HOURS, 019.25 MINUTES, START TIME = 17.42.57

DDNAME = SYSMSG   PRINTED ON PR1      , LINES = 000029
DDNAME = SYSOUT   PRINTED ON PR1      , LINES = 012617

LINES OUTPUT FOR THIS JOB = 012646

NO CARD OUTPUT FOR THIS JOB.

INPUT STARTED AT 17.25.36, COMPLETED AT 17.33.28
PRINT STARTED AT 18.04.05, COMPLETED AT 18.17.15

SYSTEM TURNAROUND TIME = 00.91.79
```

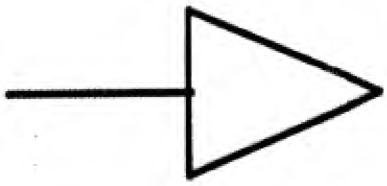
APPENDIX 4

PLOTS FROM SAMPLE PROBLEMS

AVCO

COMPUTER SERVICES

SC-4020 GRAPHICS

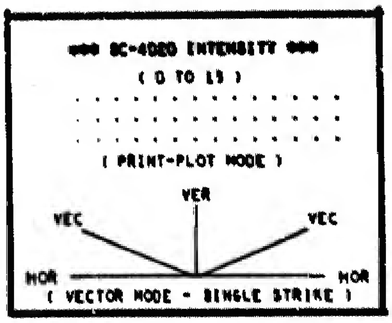


LORAYNE K210

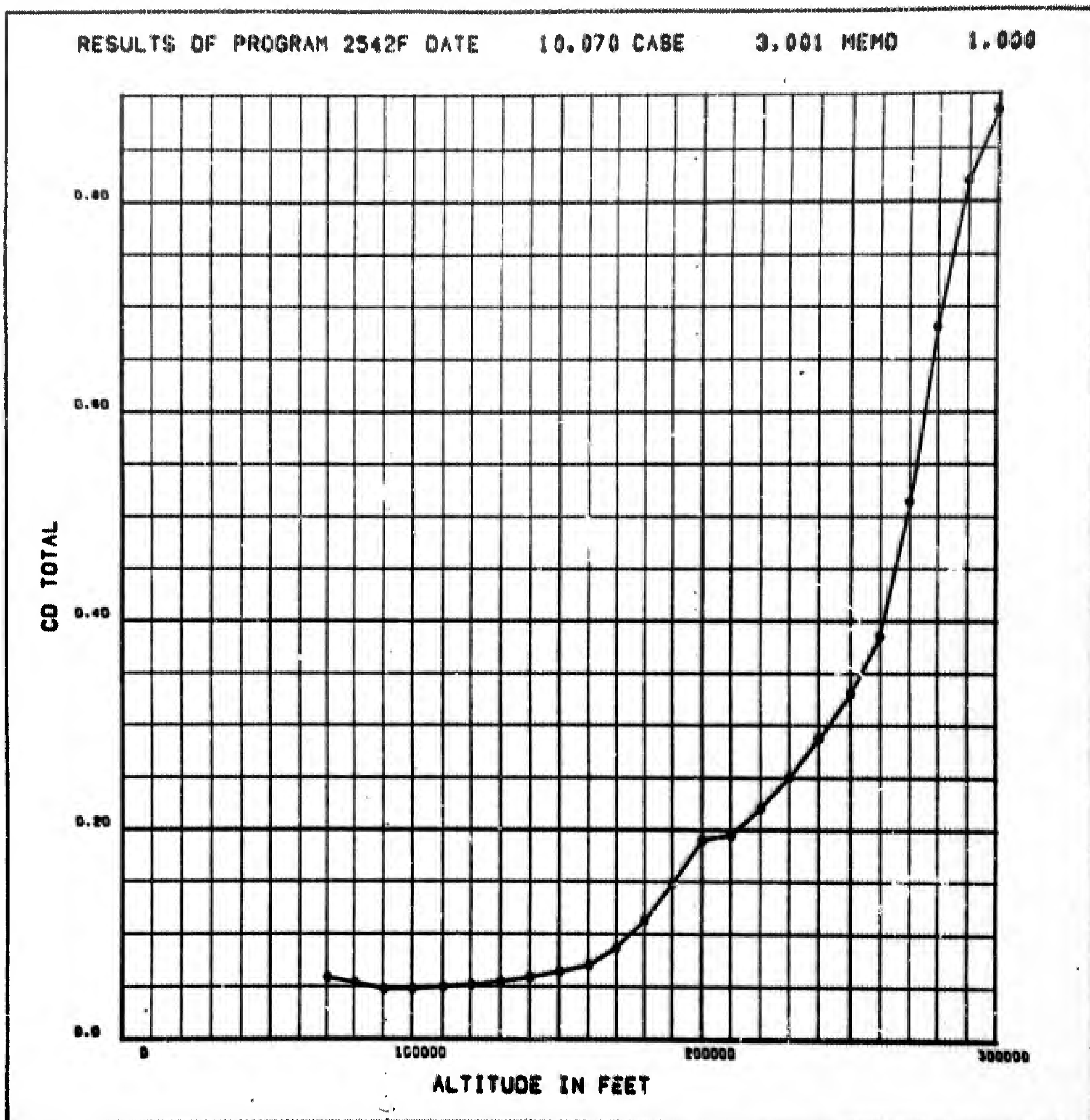
BIN

2542F

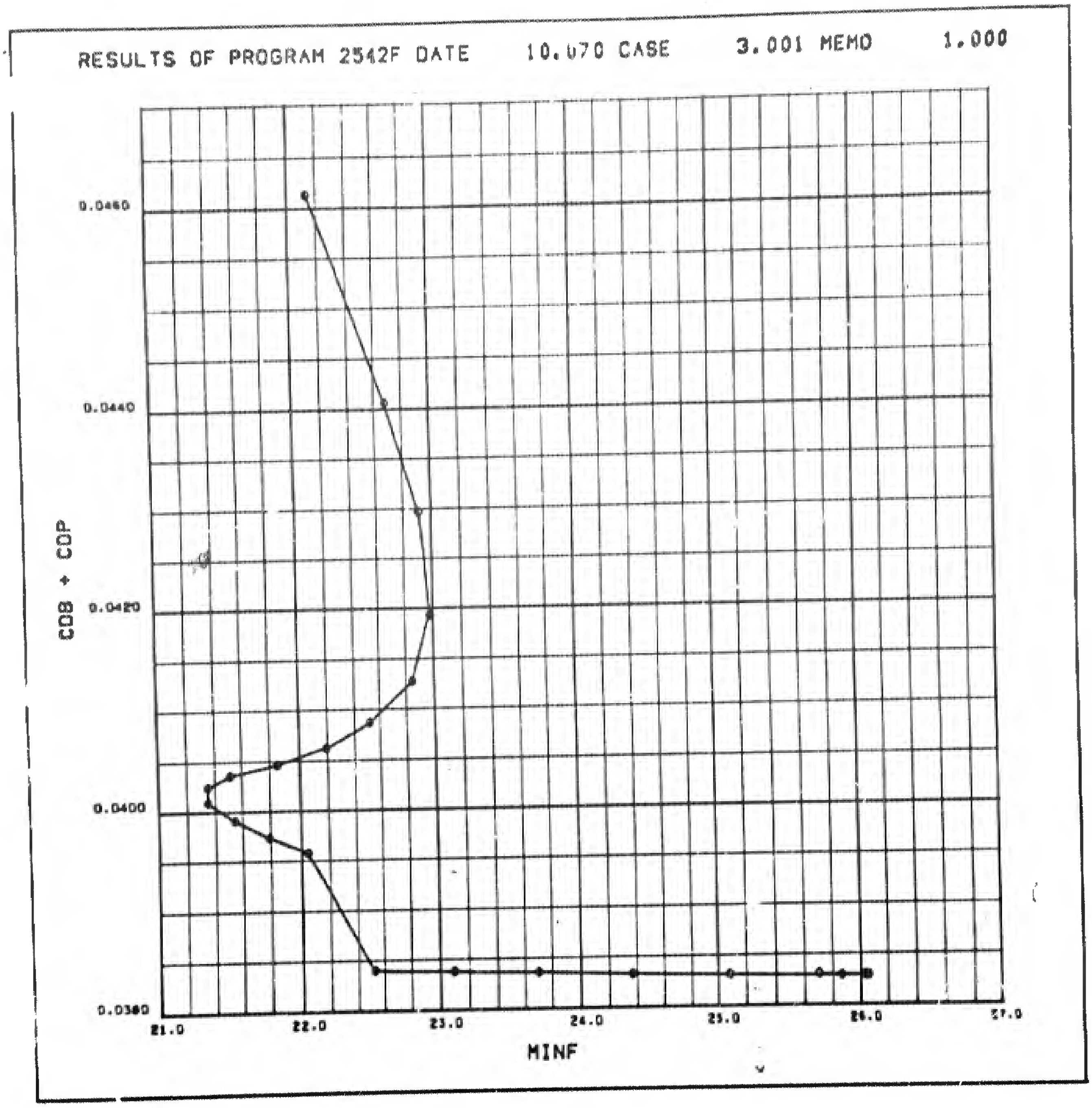
7 NOV 1968



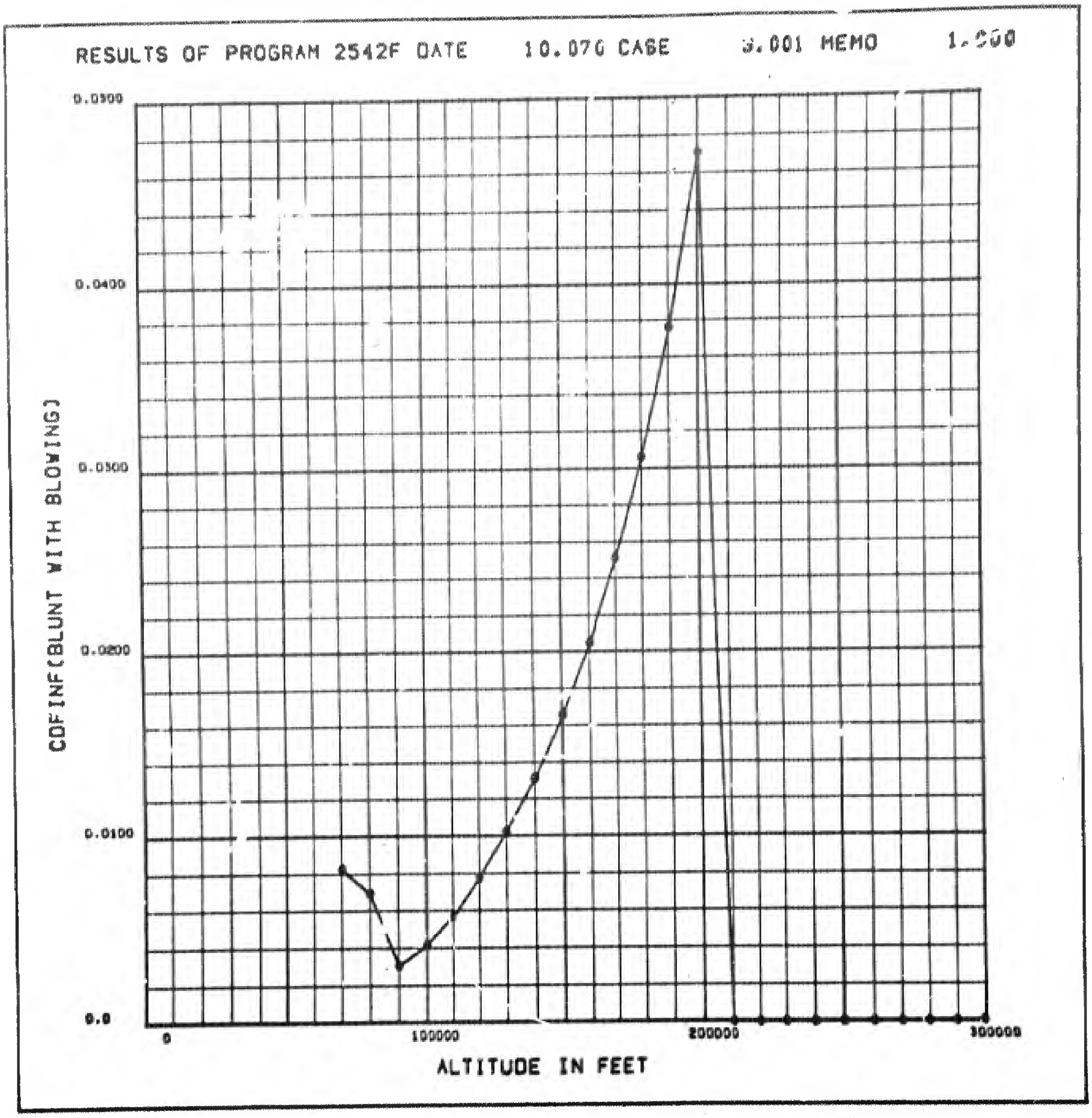
FRAME 1


RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000
CD TOTAL
0.80
0.60
0.40
0.20
0.0
0
100000
200000
300000
ALTITUDE IN FEET

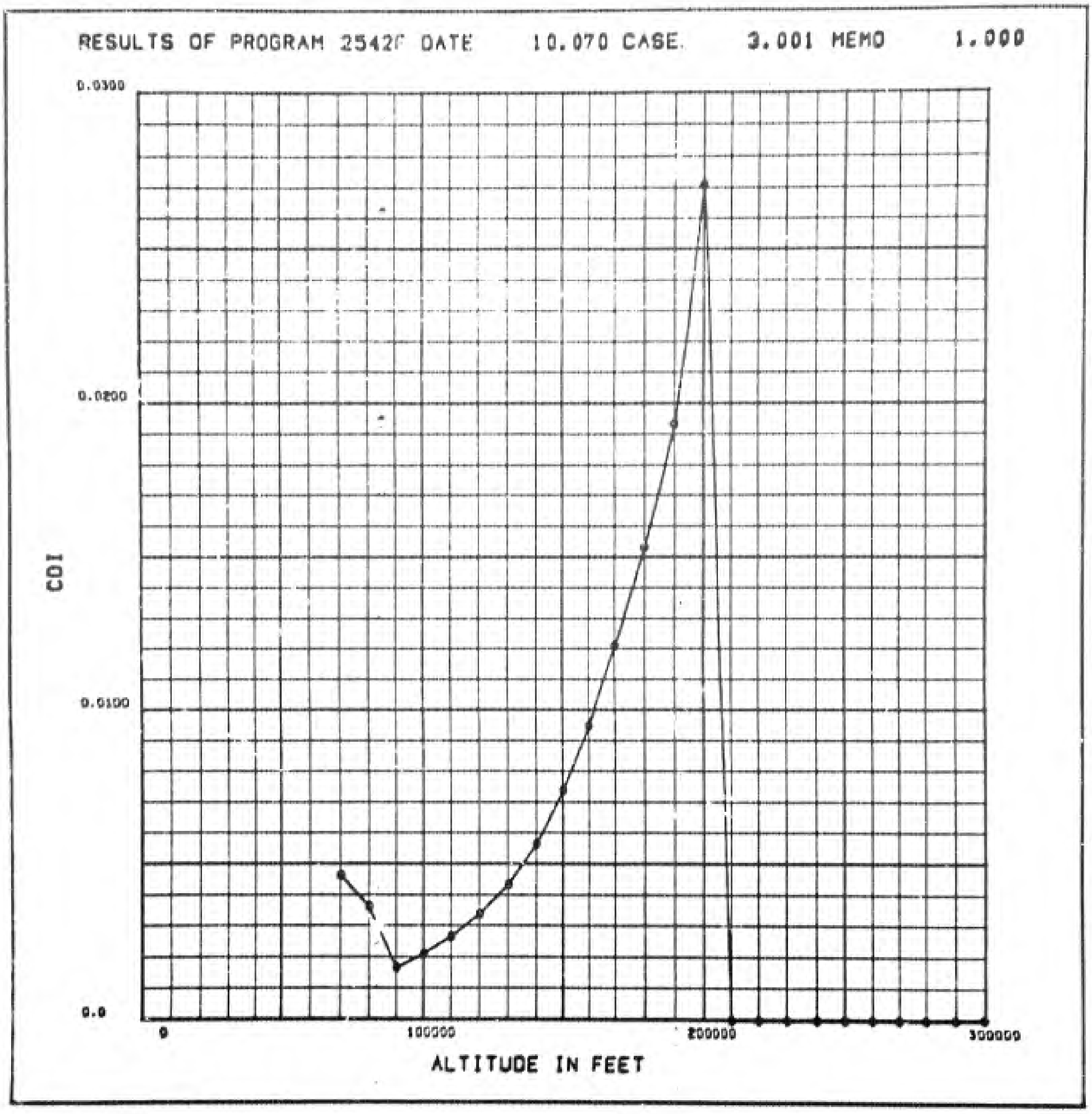
FRAME 2


RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000
0.0460
0.0440
0.0420
0.0400
0.0380
CDB + CDP
21.0
22.0
23.0
24.0
25.0
26.0
27.0
MINF

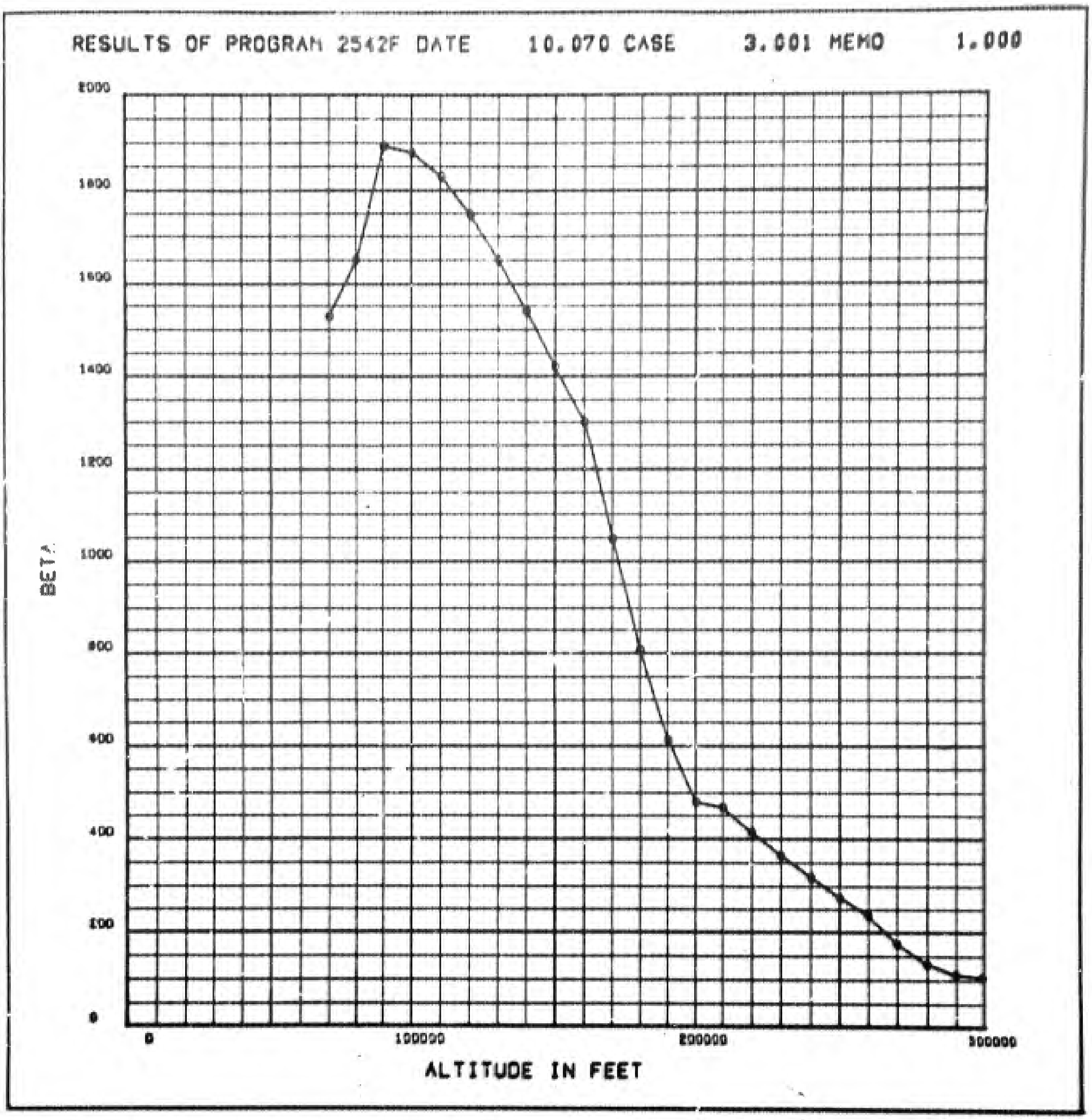
FRAME 3


RESULTS OF PROGRAM 2542F DATE 10.070 CASE 9.001 MEMO 1.000
0.0500
0.0400
0.0300
0.0200
0.0100
0.0
CDFINF(BLUNT WITH BLOWING)
0
100000
200000
300000
ALTITUDE IN FEET

FRAME 4


RESULTS OF PROGRAM 2542C DATE 10.070 CASE 3.001 MEMO 1.000
0.0300
0.0200
0.0100
0.0
CDI
0
100000
200000
300000
ALTITUDE IN FEET

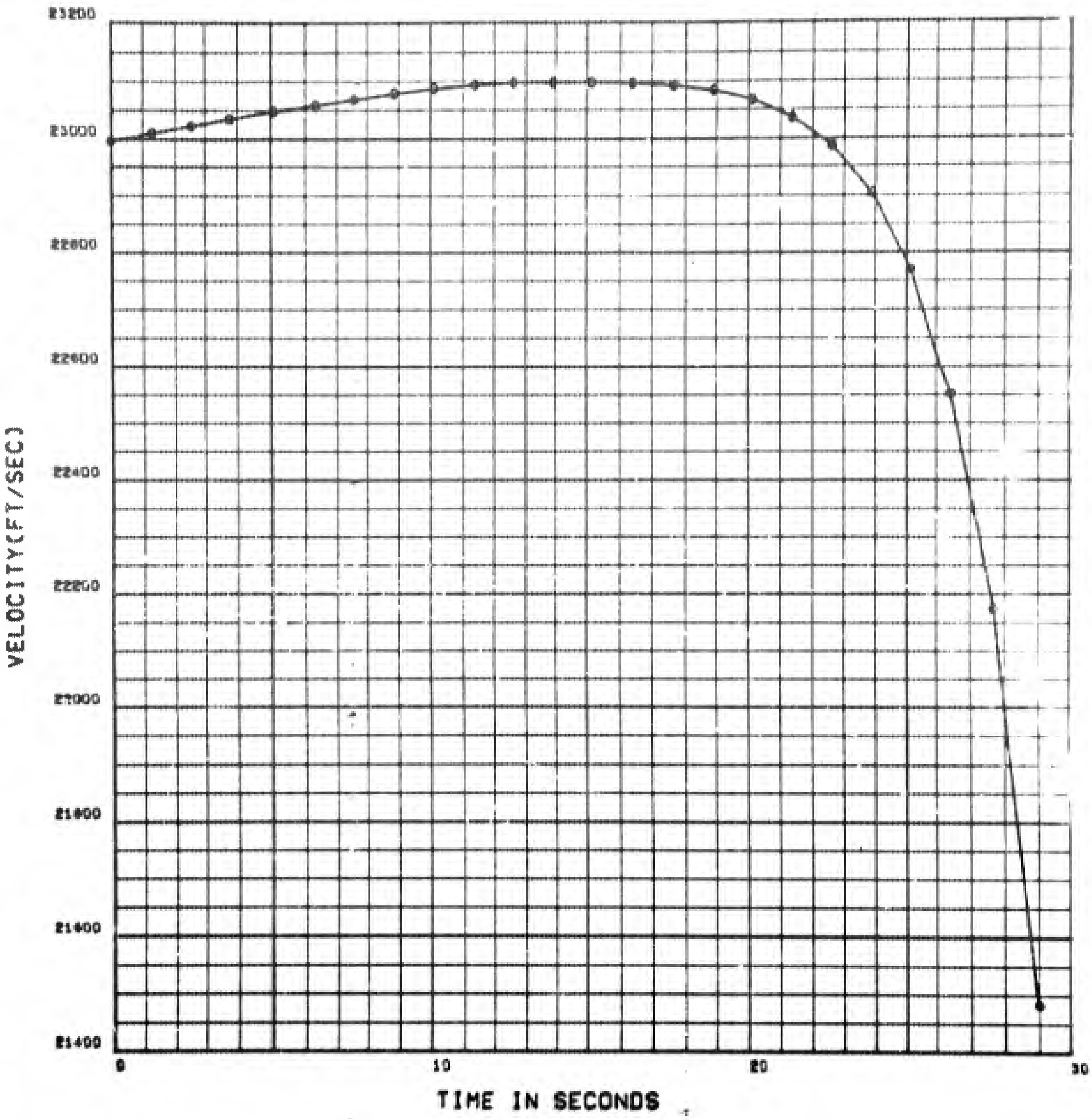
FRAME 5



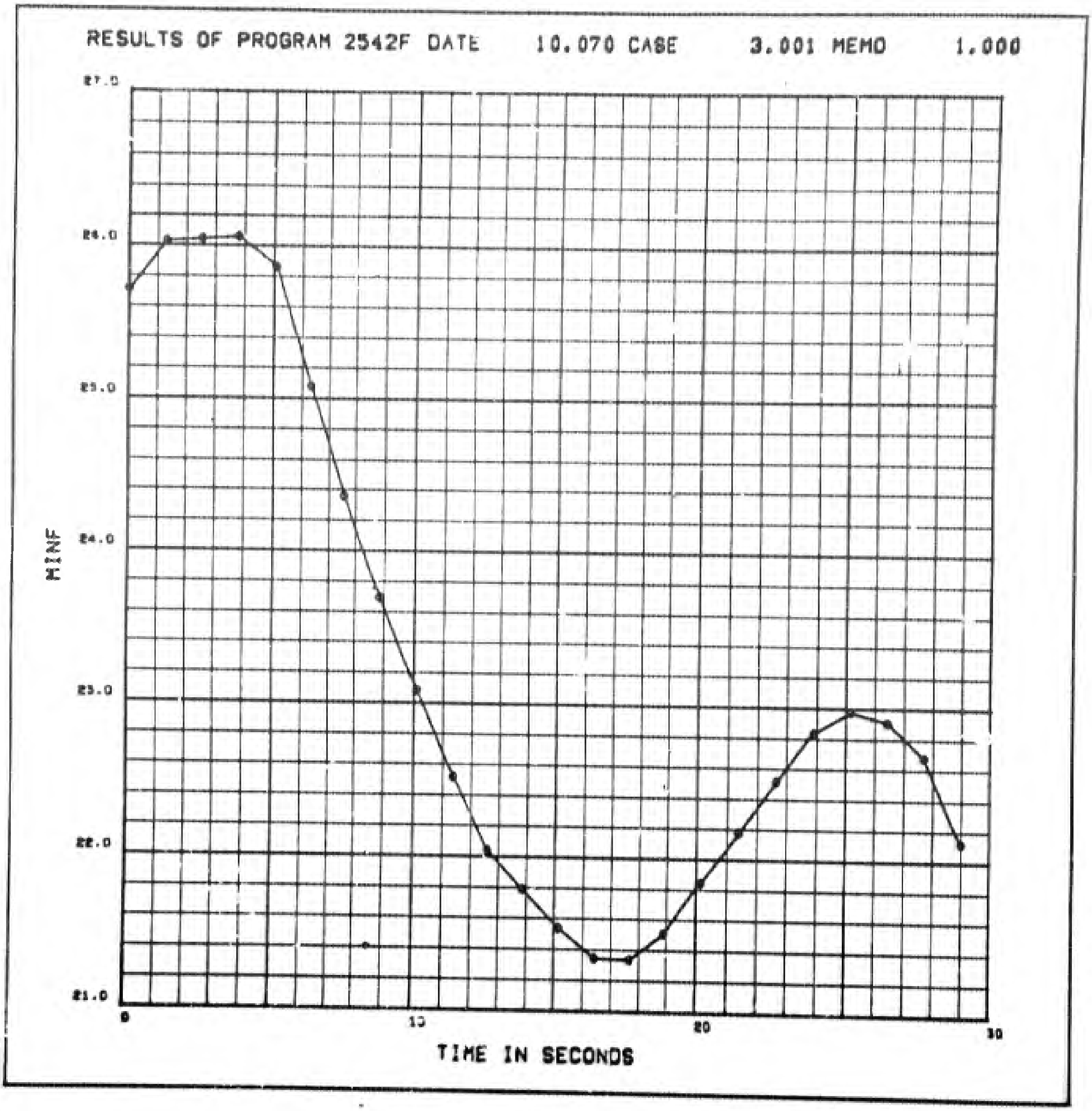
RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000
BETA
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
100000
200000
300000
ALTITUDE IN FEET

FRAME 6

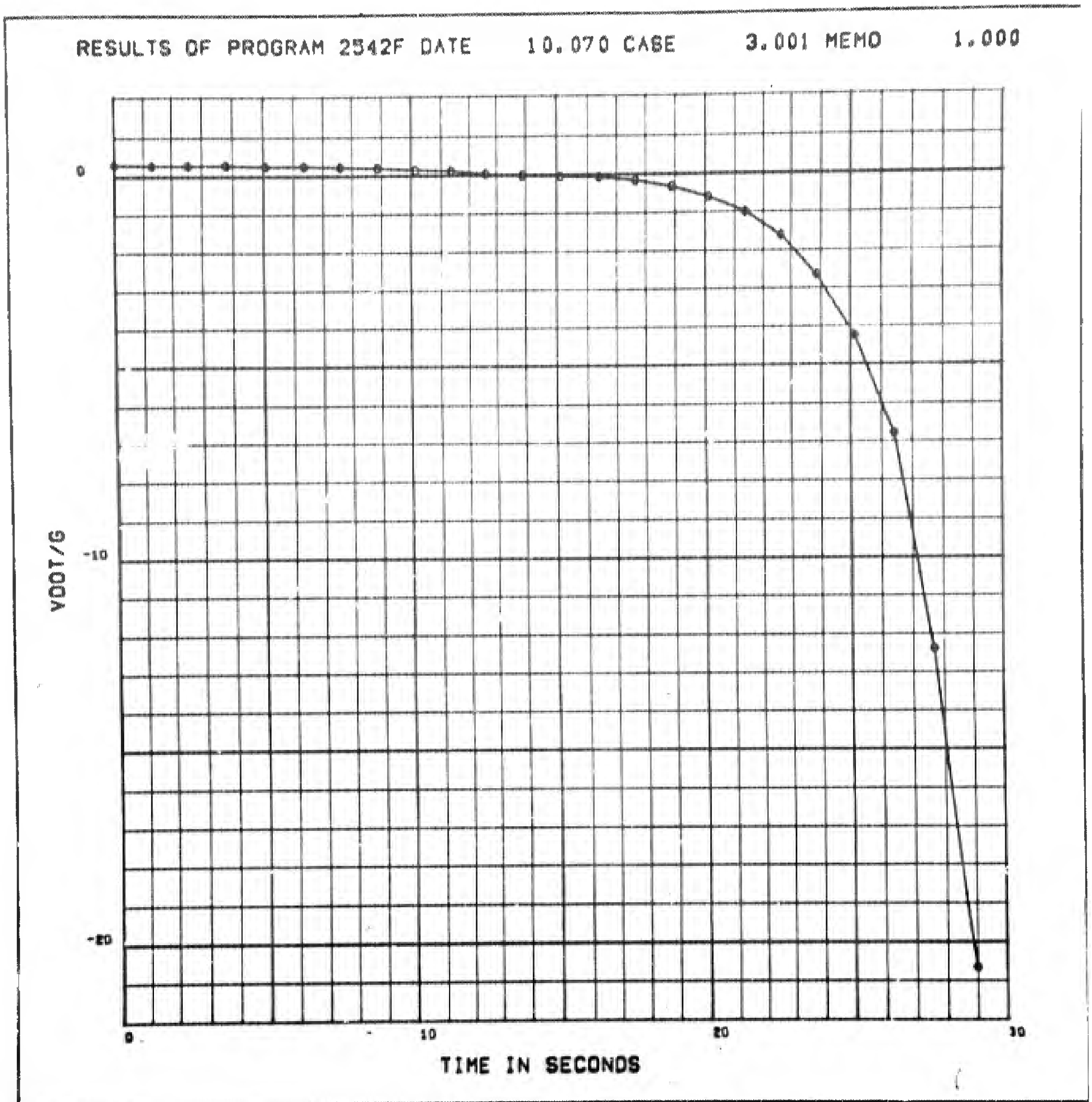
RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000



FRAME 7

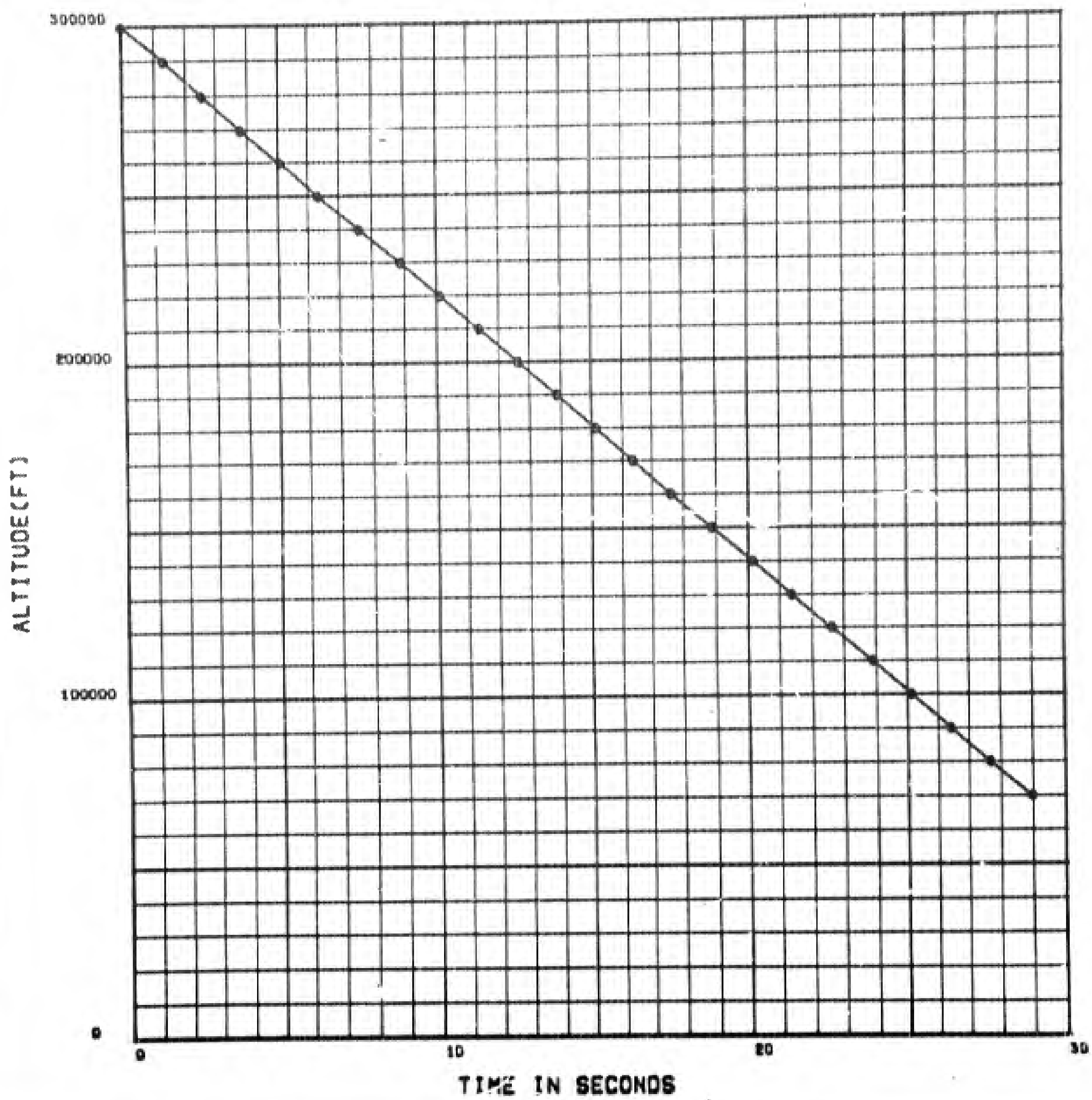

RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000
27.0
26.0
25.0
24.0
23.0
22.0
21.0
MINF
0
10
20
30
TIME IN SECONDS

FRAME 8

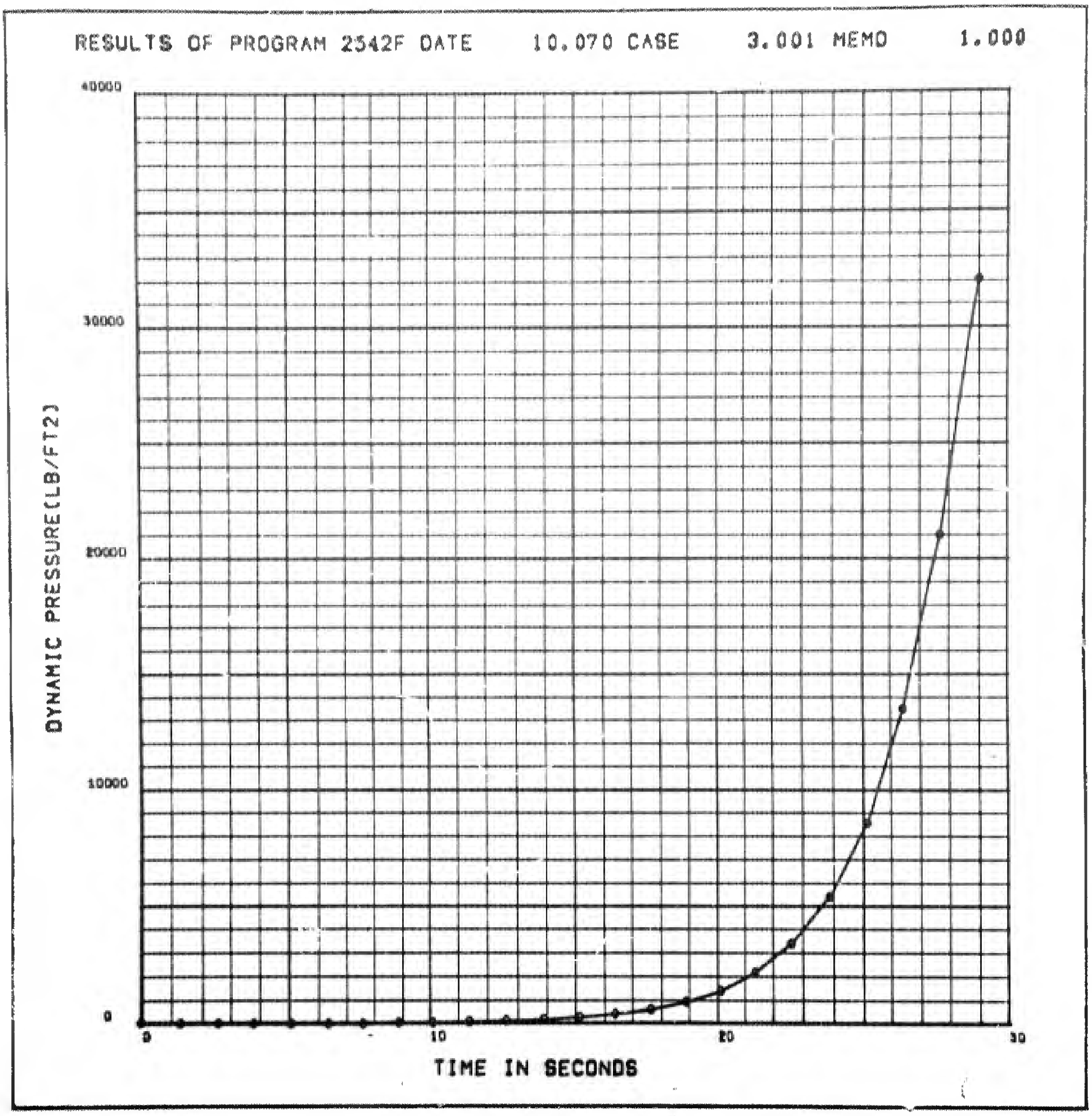

RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000
VDOT/G
0
-10
-20
0
10
20
30
TIME IN SECONDS

FRAME 9

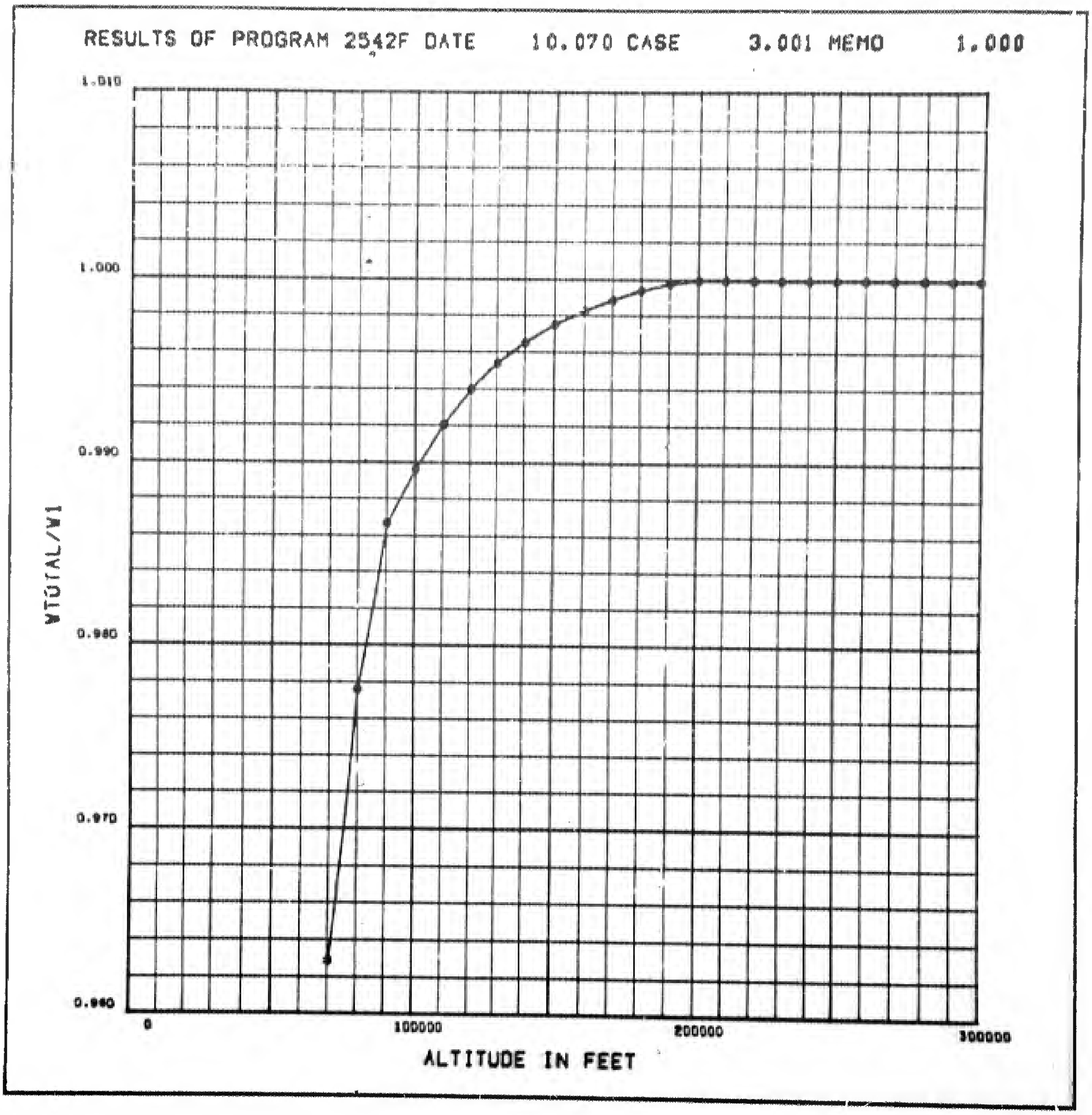
RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000



FRAME 10

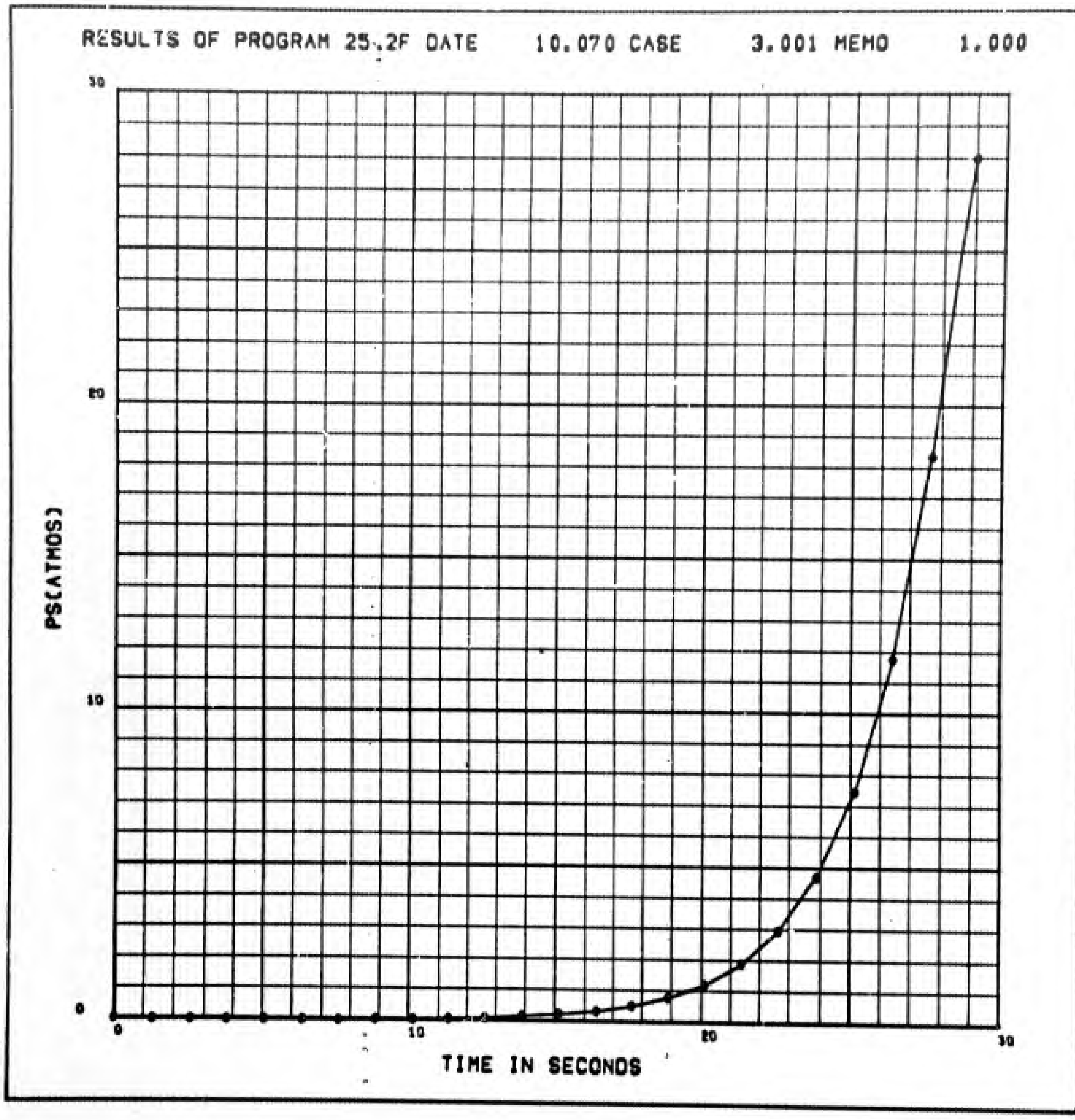

RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000
DYNAMIC PRESSURE(LB/FT2)
40000
30000
20000
10000
0
0
10
20
30
TIME IN SECONDS

FRAME 11



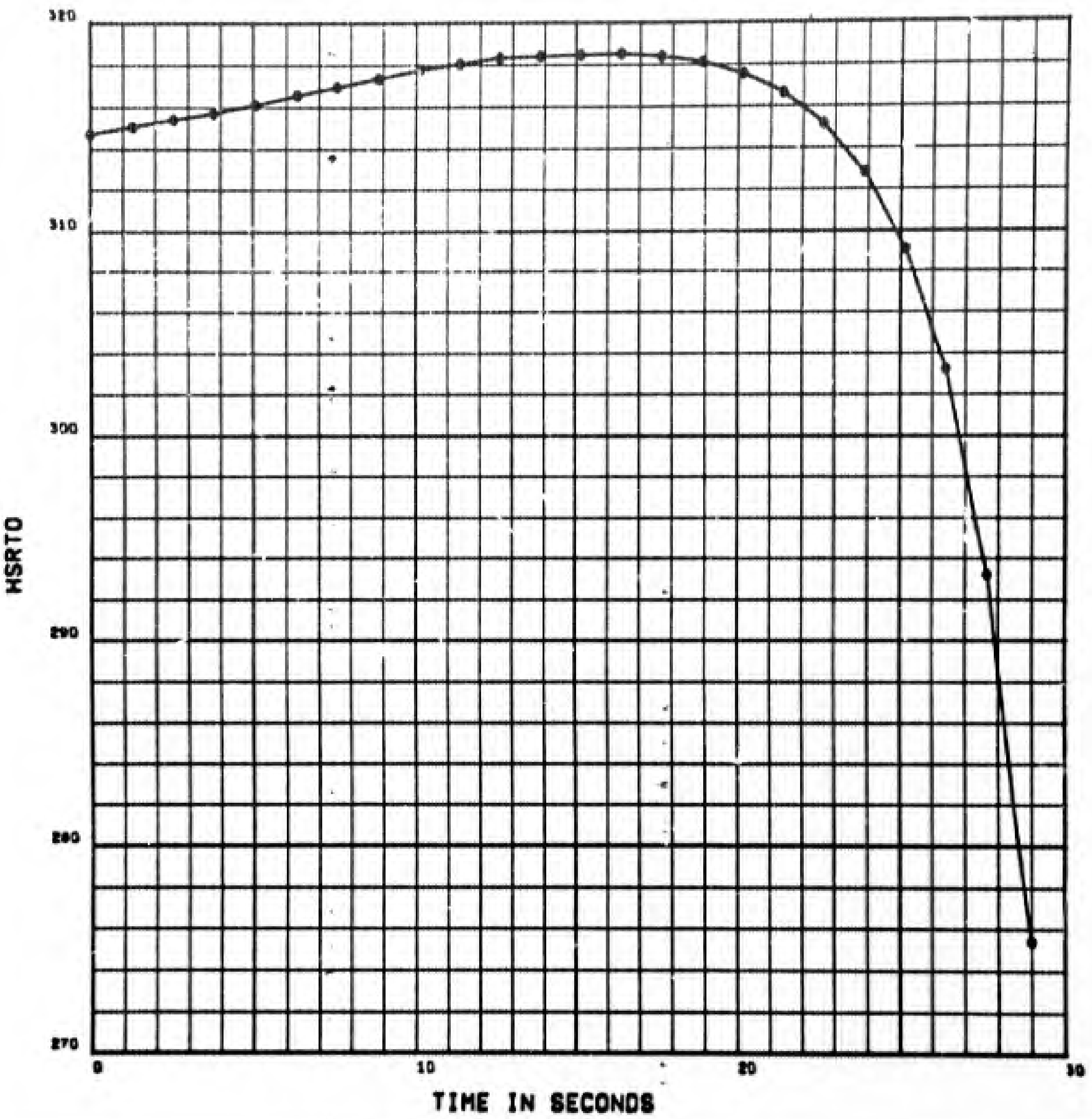
RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000
1.010
1.000
0.990
0.980
0.970
0.960
WTOTAL/W1
0
100000
200000
300000
ALTITUDE IN FEET

FRAME 12

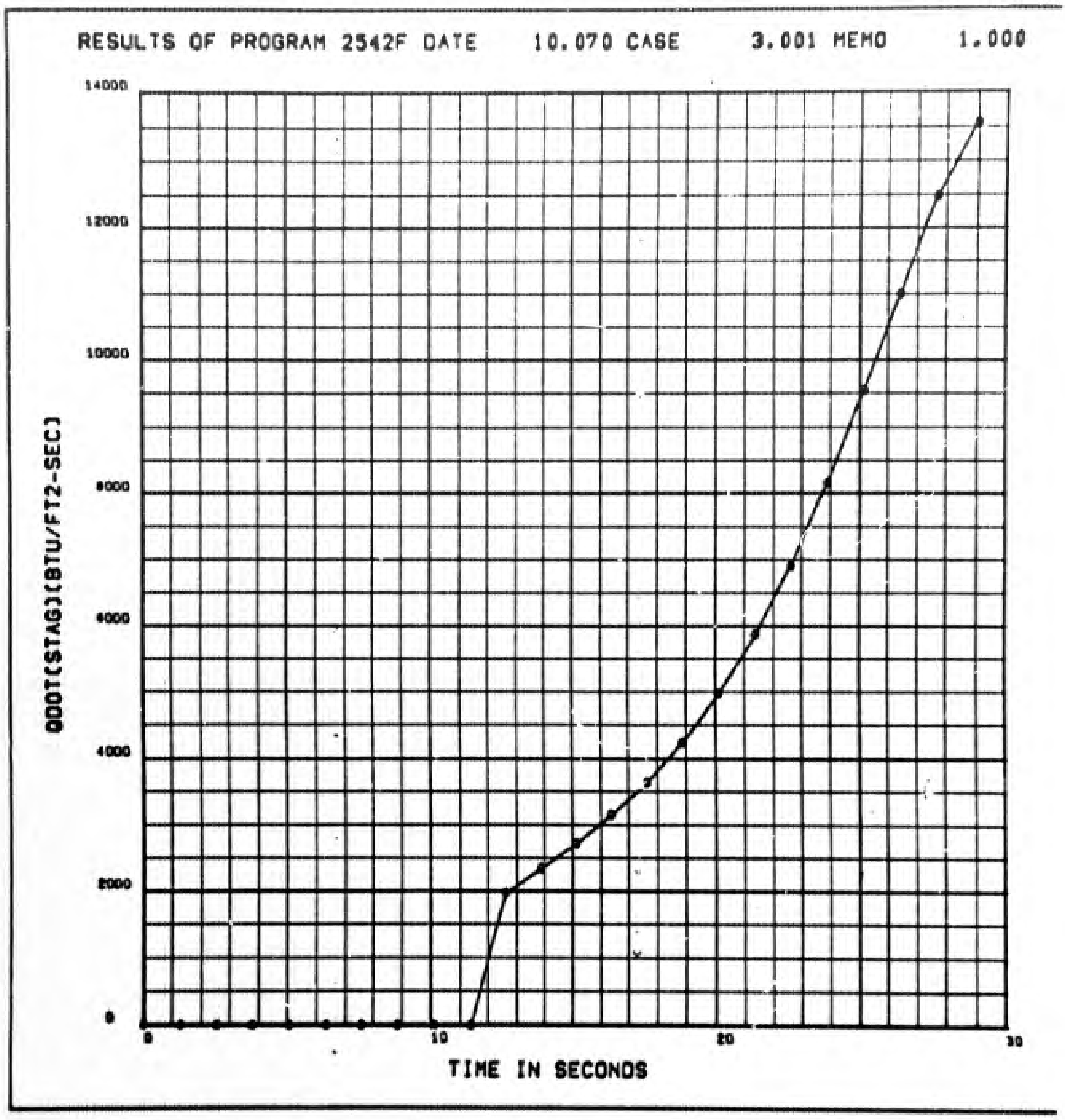

RESULTS OF PROGRAM 25.2F DATE 10.070 CASE 3.001 MEMO 1.000
30
20
10
0
PS(ATMOS)
0
10
20
30
TIME IN SECONDS

FRAME 13

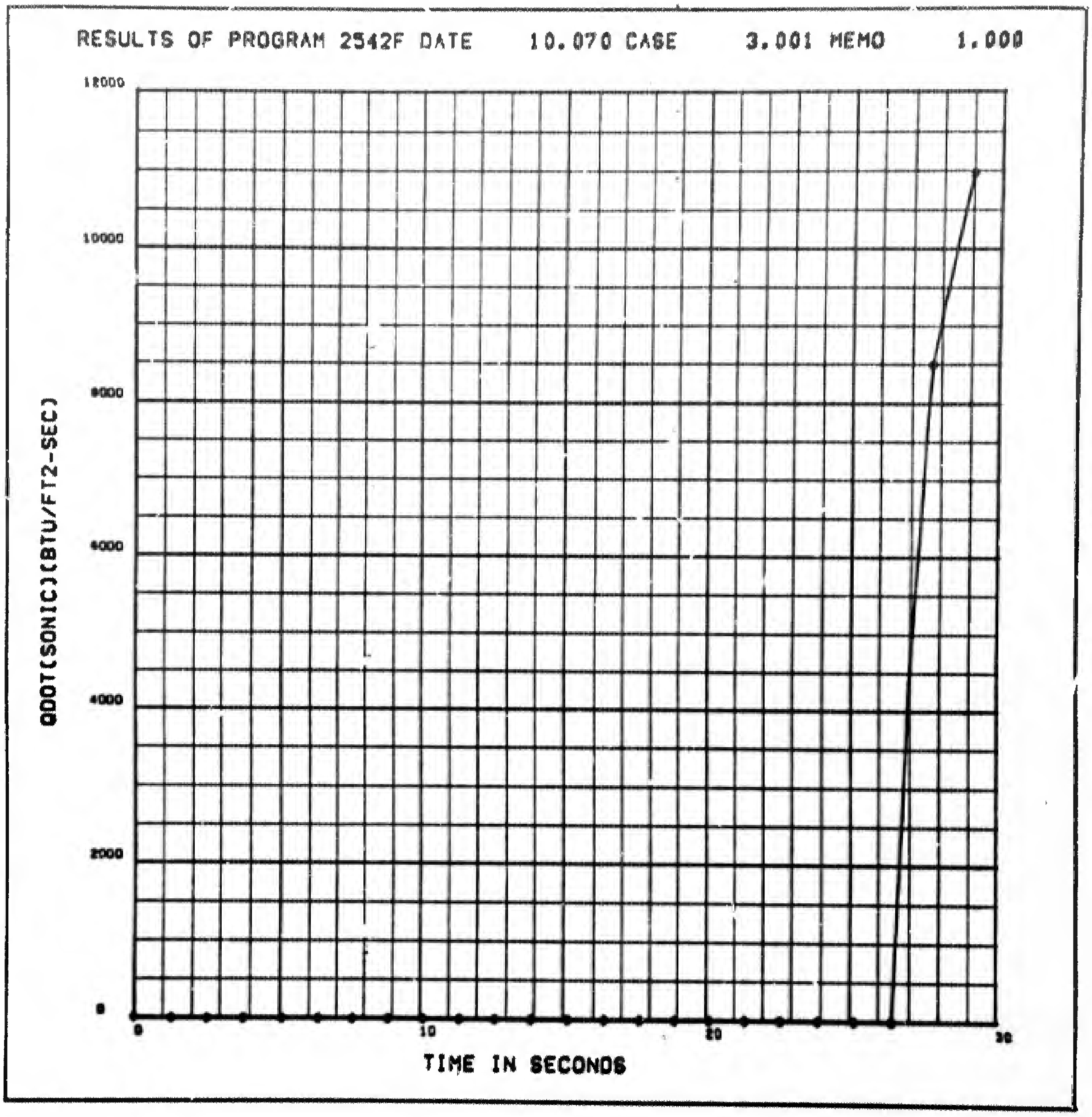
RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000



FRAME 14

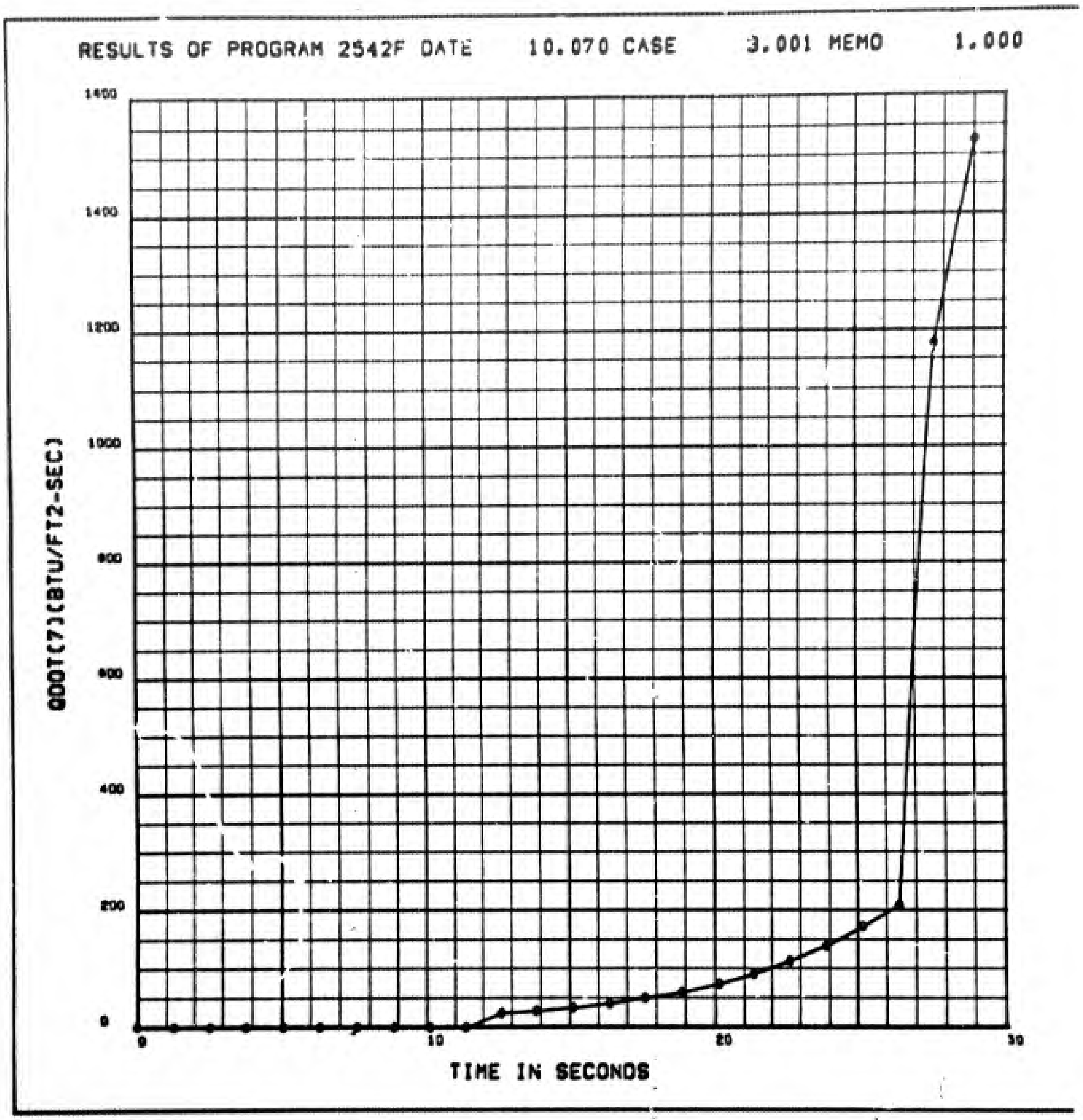

RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000
QDOT(STAG)(BTU/FT2-SEC)
14000
12000
10000
8000
6000
4000
2000
0
0
10
20
30
TIME IN SECONDS

FRAME 15

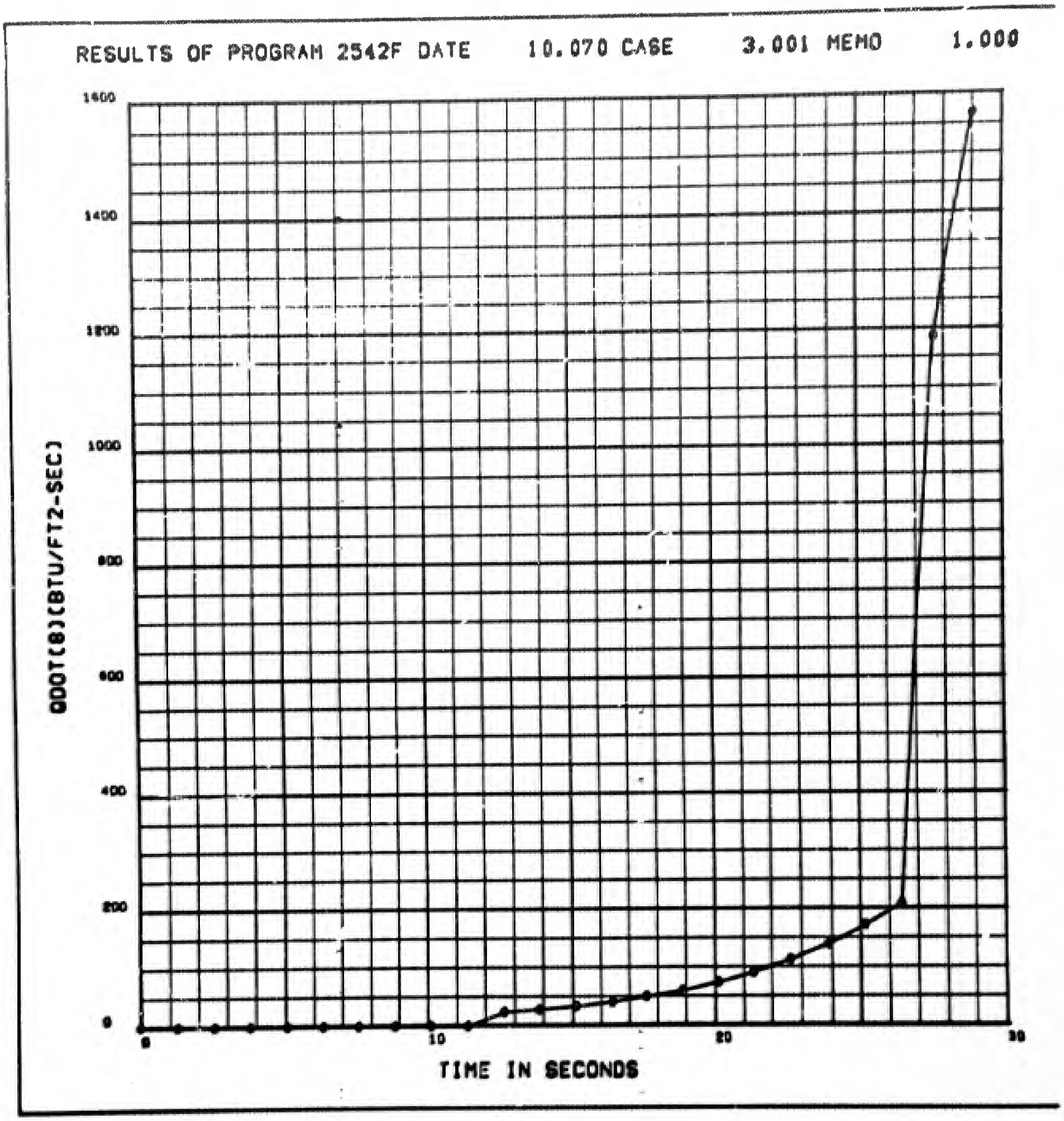


RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000
QDOT(SONIC)(BTU/FT2-SEC)
TIME IN SECONDS

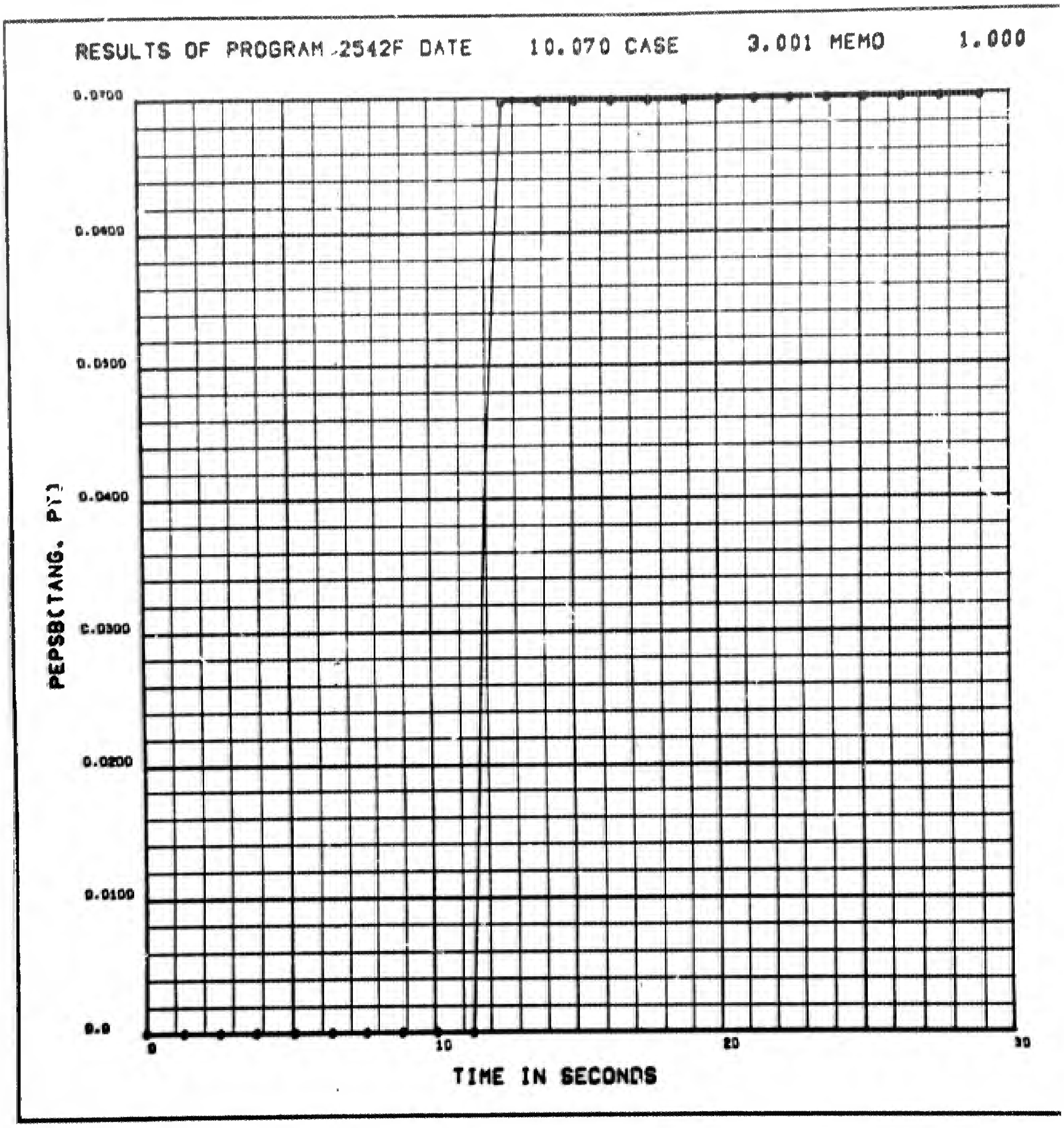
FRAME 16


RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000
1400
1400
1200
1000
800
600
400
200
0
QDOT(7)(BTU/FT2-SEC)
0
10
20
30
TIME IN SECONDS

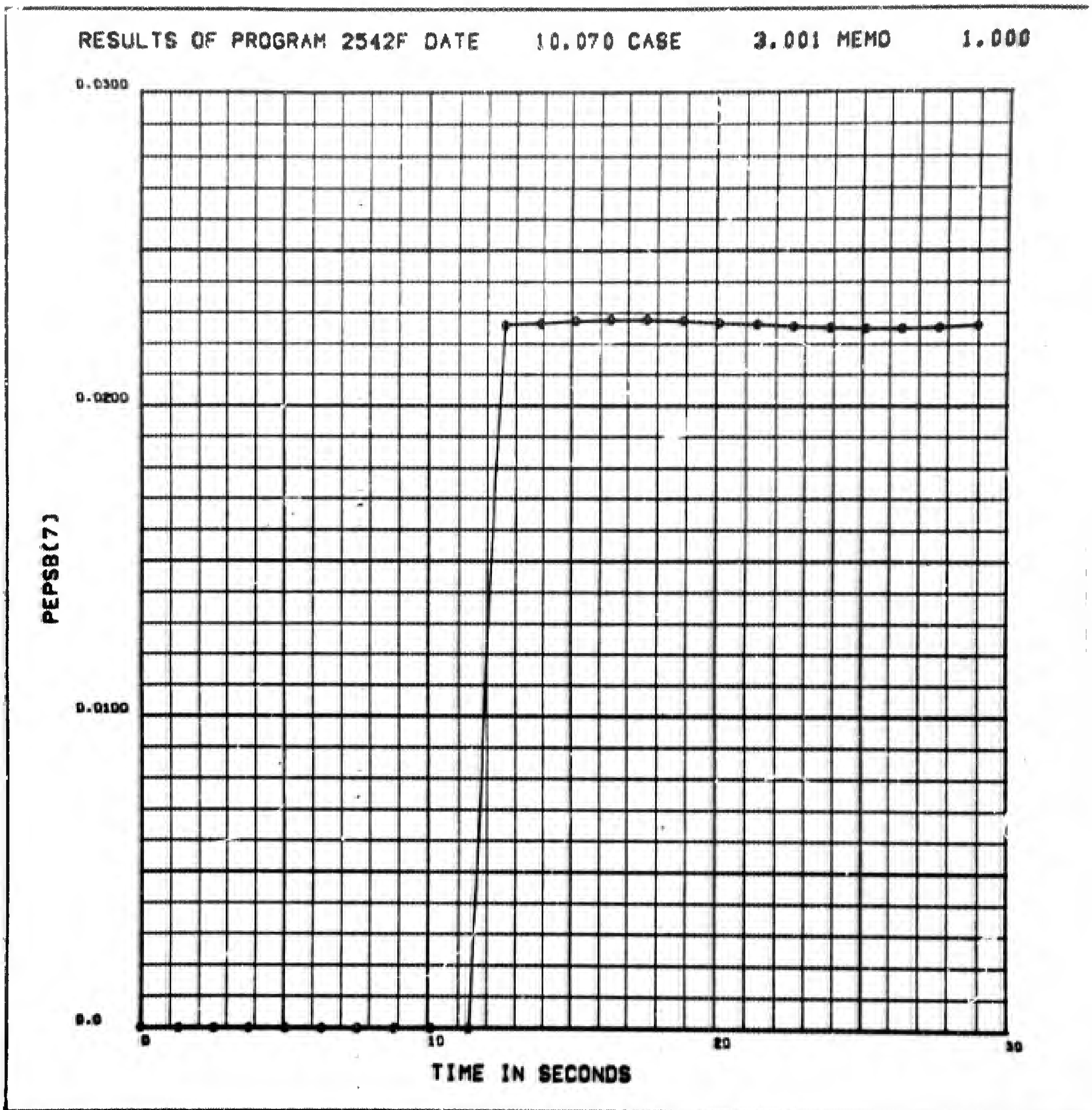
FRAME 17


RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000
1600
1400
1200
1000
800
600
400
200
0
0
10
20
30
QDOT(8)(BTU/FT2-SEC)
TIME IN SECONDS

FRAME 18


RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000
0.0700
0.0600
0.0500
0.0400
0.0300
0.0200
0.0100
0.0
PEPSB(TANG. PT)
0
10
20
30
TIME IN SECONDS

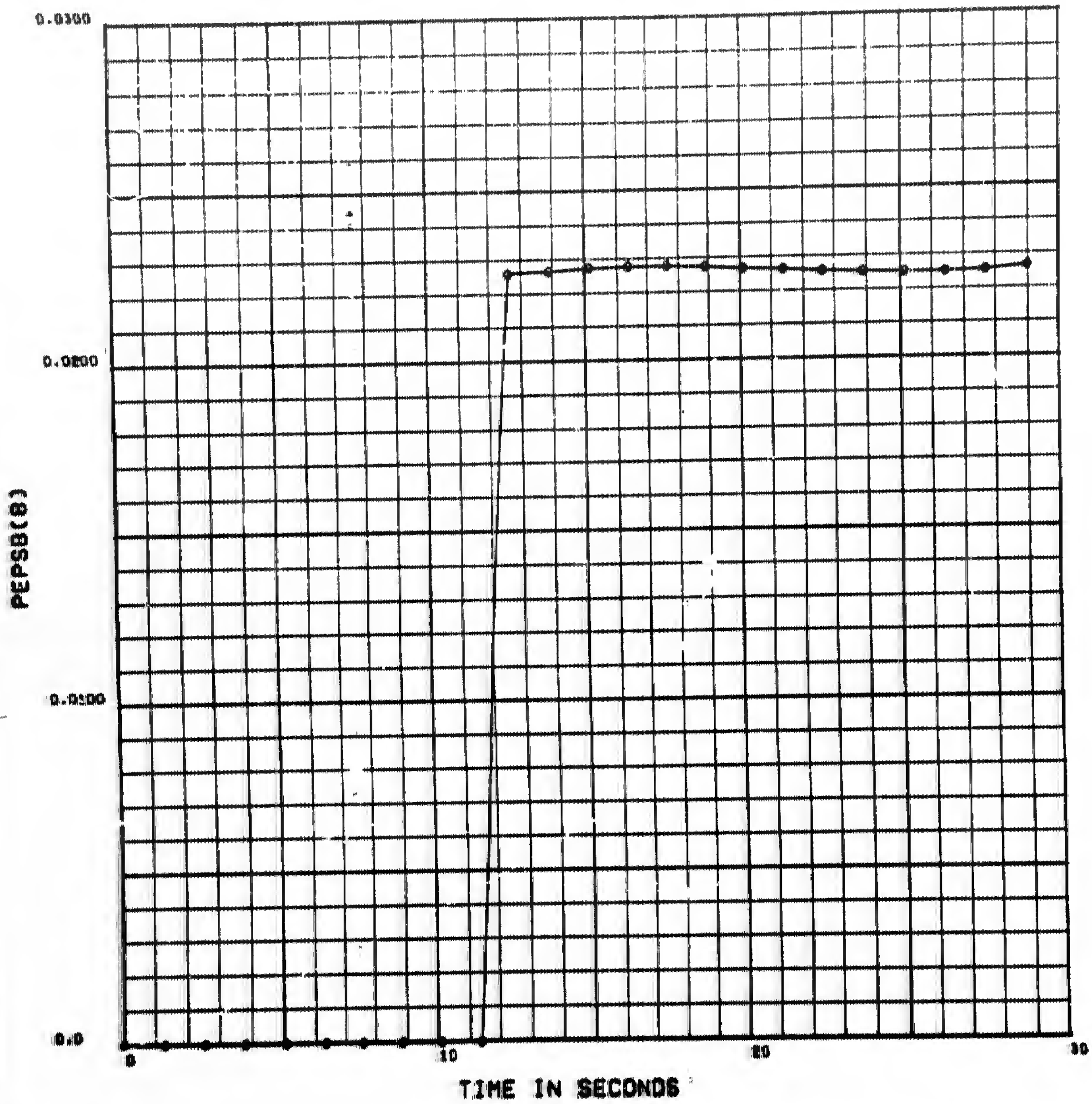
FRAME 19



RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000
0.0300
0.0200
0.0100
0.0
PEPSB(7)
0
10
20
30
TIME IN SECONDS

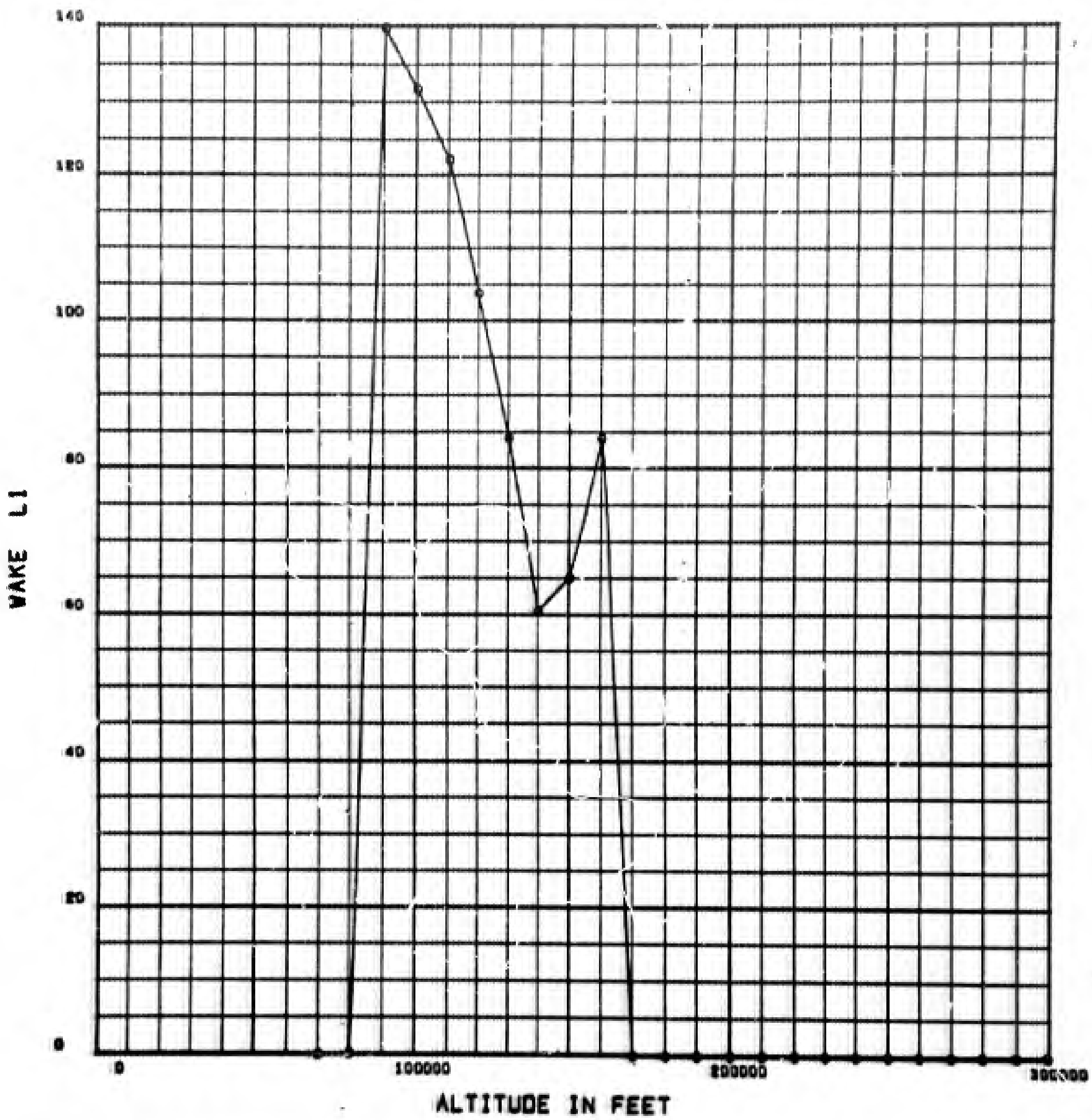
FRAME 20

RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000

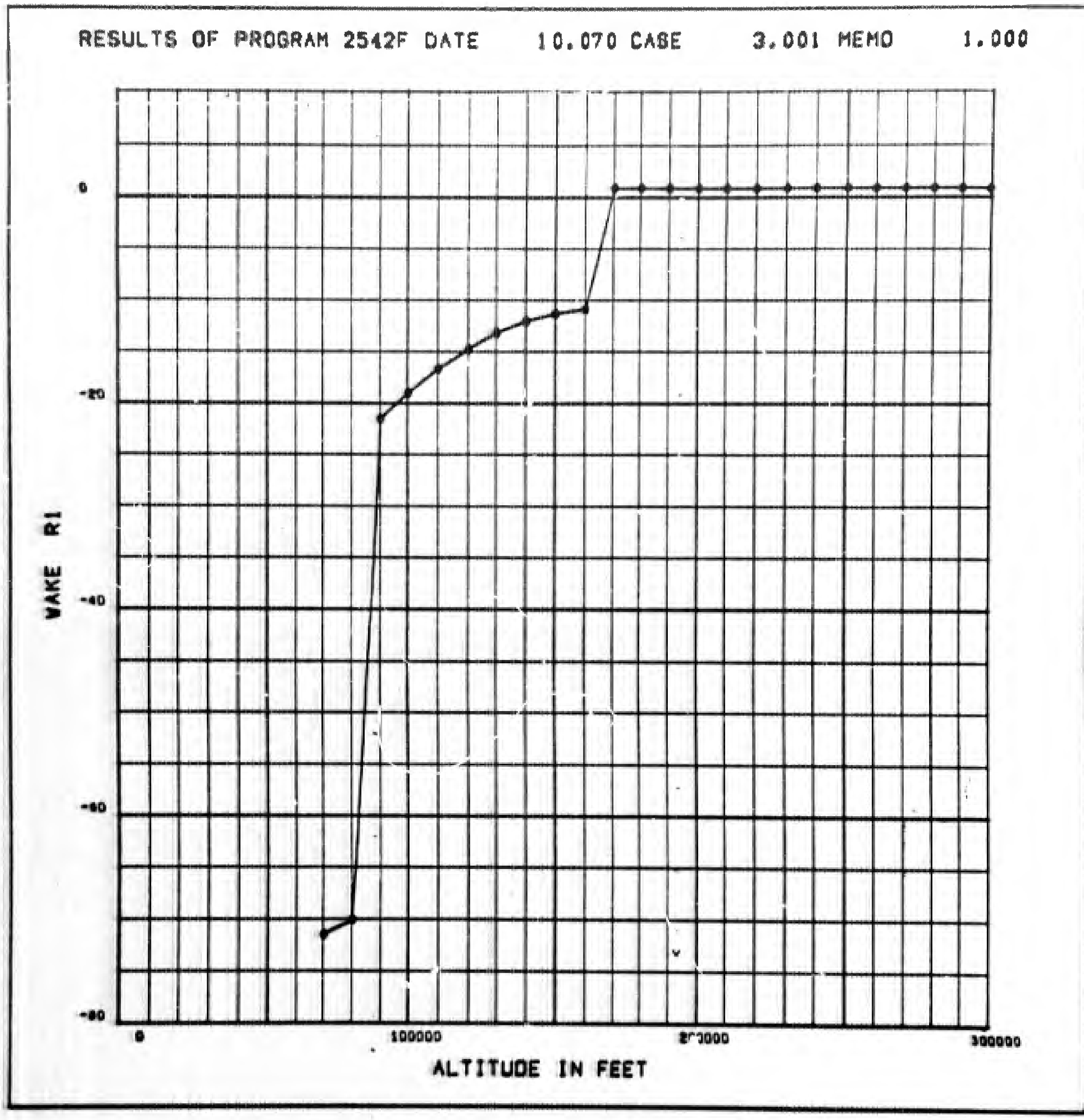


FRAME 21

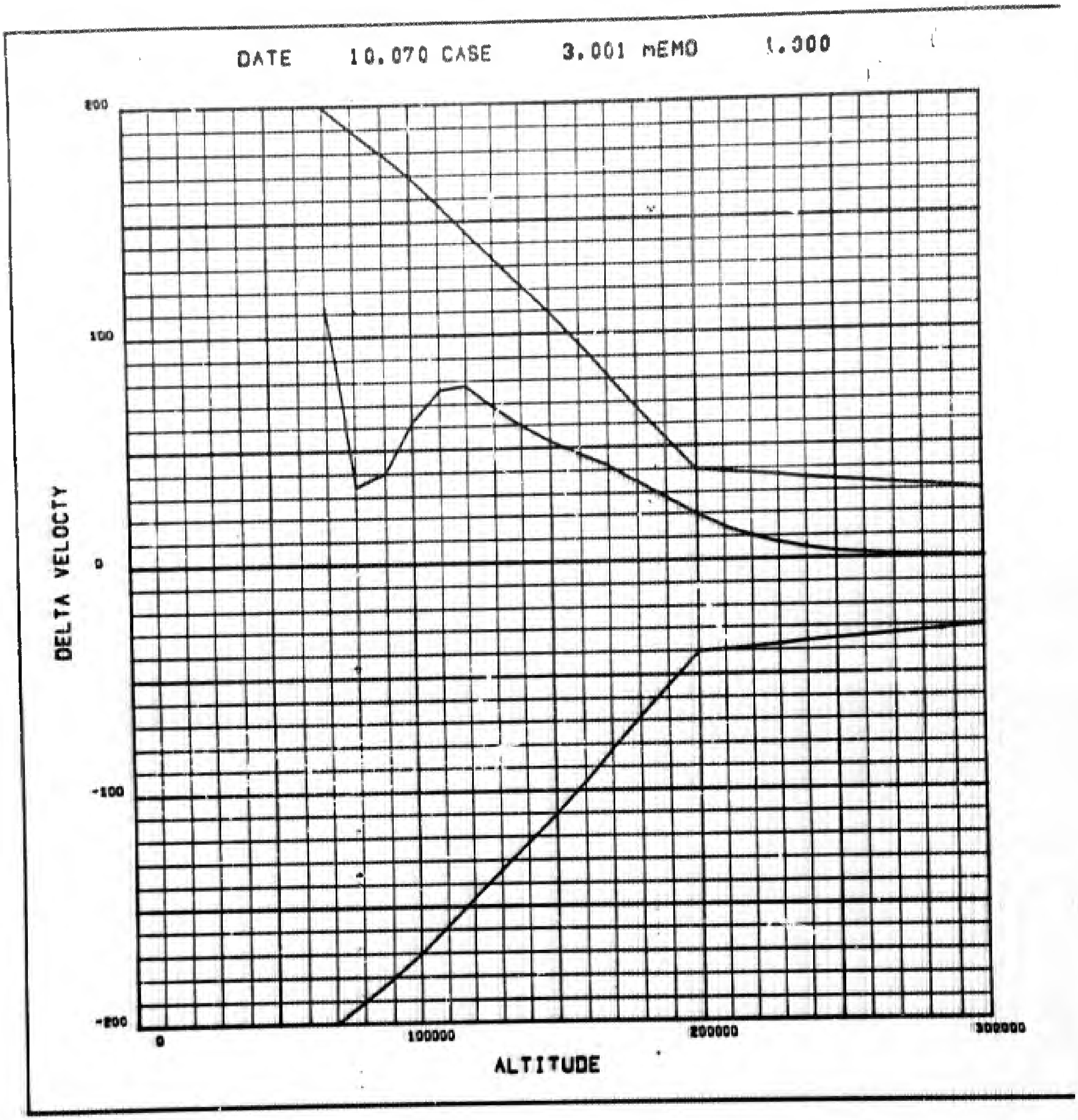
RESULTS OF PROGRAM 2342F DATE 10.070 CASE 3.001 MEMO 1.000



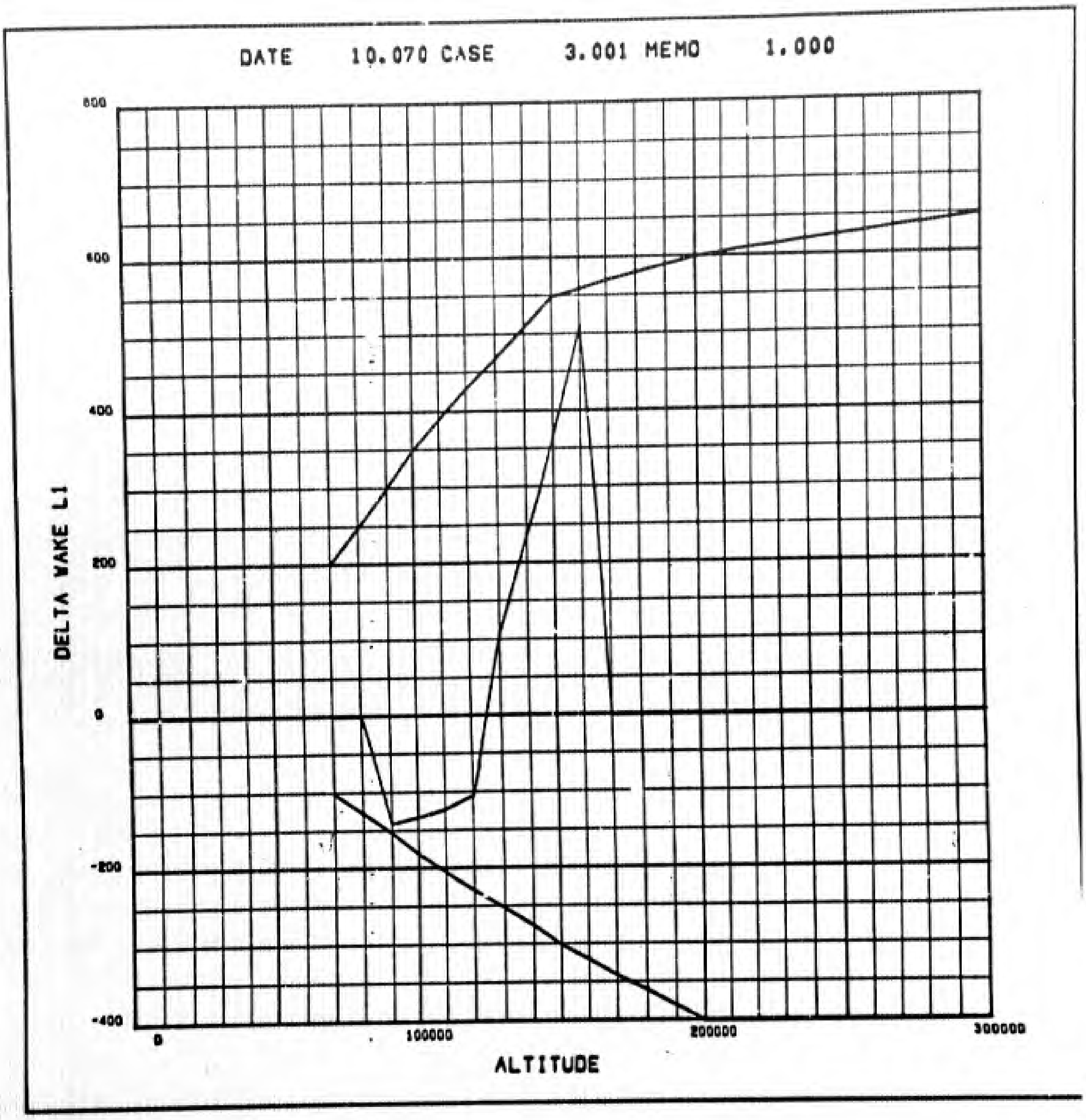
FRAME 22


RESULTS OF PROGRAM 2542F DATE 10.070 CASE 3.001 MEMO 1.000
WAKE RI
0
-20
-40
-60
-80
0
100000
200000
300000
ALTITUDE IN FEET

FRAME 23

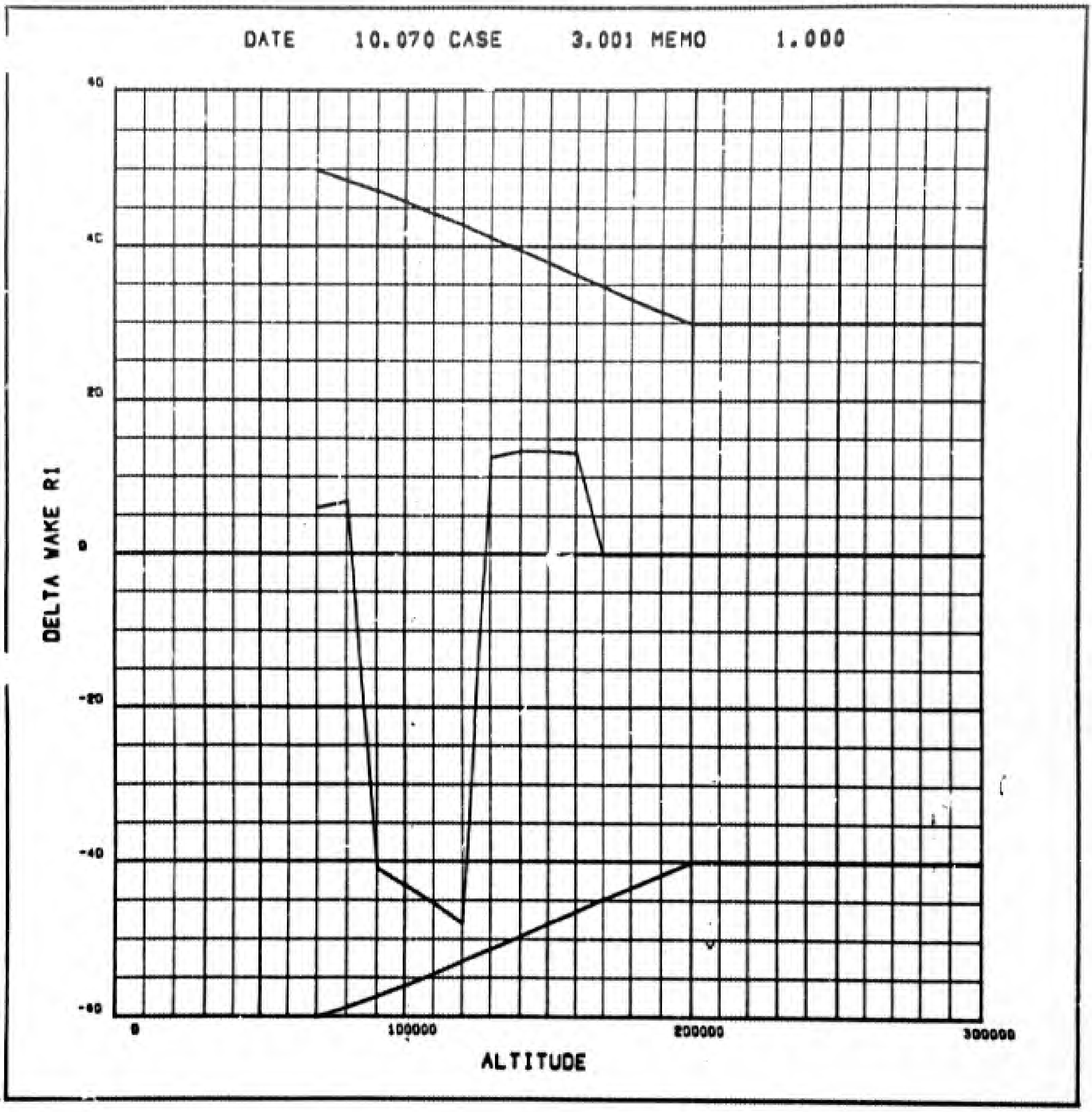

DATE 10.070 CASE 3.001 MEMO 1.000
200
100
0
-100
-200
DELTA VELOCTY
0
100000
200000
300000
ALTITUDE

FRAME 24



DATE 10.070 CASE 3.001 MEMO 1.000
DELTA WAKE L1
600
400
200
0
-200
-400
0
100000
200000
300000
ALTITUDE

FRAME 25


DATE 10.070 CASE 3.001 MEMO 1.000
40
40
20
0
-20
-40
-60
DELTA WAKE R1
0
100000
200000
300000
ALTITUDE

FRAME 26

END
OF JOB

FRAME 27